SECTION 03301--CONCRETE

PART 1--GENERAL

WORK INCLUDED:

This section is a brief ready-mix concrete and reinforcing bar specification for small quantities of concrete (not over 40 cubic yards), for slabs on grade, floors, and shallow footing.

REFERENCES:

The following is a list of standards which may be referenced in this section:

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 117	Standard Specifications for Tolerances for Concrete Construction and Materials
ACI 301	Specifications for Structural Concrete for Buildings
ACI 305	Hot Weather Concreting
ACI 306.1	Standard Specification for Cold Weather Concreting
ACI 318/318R	Building Code Requirements for Reinforced Concrete
ACI 347	Formwork for Concrete

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A185	Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement.
ASTM A615	Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field.
ASTM C33	Standard Specification for Concrete Aggregates.
ASTM C39	Standard Test Methods for Compressive Strength of Cylindrical Concrete Specimens.
ASTM C94	Standard Specification for Ready-Mix Concrete.
ASTM C150	Standard Specification for Portland Cement.
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete.
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
ASTM C494	Standard Specification for Chemical Admixtures for Concrete.

ASTM C618	Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.
ASTM C857	Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures.
ASTM C858	Standard Specification for Underground Precast Utility Structures.
ASTM D994	Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).

CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

CRSI	Manual of Standard Practice.
	Recommended Practice for Placing Reinforcing Bars.

ENVIRONMENTAL REQUIREMENTS:

Do not place concrete when the ambient temperature is below 40 degrees F or approaching 40 degrees F and air temperature less than 40 degrees F for the first 7 days, without special protection to keep concrete above 40 degrees F.

Do not use curing compound where solvents in the curing compounds are prohibited by state or federal air quality laws.

Form sealer shall be a ready-to-use water based material formulated to reduce or eliminate surface imperfections, containing no mineral oil or organic solvents. Environmentally safe, meeting local, state, and federal regulations.

PART 2--PRODUCTS

FORM MATERIALS:

Forms for Exposed Finish Concrete: Provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without visible bow or deflection:

Plywood shall comply with American Plywood Association, grade "EXT-DFPA PLYFORM" or better.

Forms for Unexposed Finish Concrete: Form concrete surfaces, which will be, unexposed in finished structure with plywood, lumber, or metal.

Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

CONCRETE MATERIALS:

Portland Cement: Cement shall conform to ASTM C150, Type I-II. The cement shall contain no more than 0.60 percent by weight of alkalies calculated as (Na2O + 0.658 K2O).

Pozzolans: Pozzolans (fly ash) shall conform to ASTM C618 Class F, except that the loss on ignition (LOI) shall be less than 2 percent.

Aggregate: Fine and coarse aggregate shall conform to ASTM C33. Maximum coarse aggregate size shall conform to ACI 318, paragraph 3.3.2. Unless otherwise specified, maximum aggregate size shall be 1-1/2 inches.

Mixing Water: Potable having no pronounced taste or odor, and containing no deleterious materials.

Air-Entraining Agents (AEA): ASTM C260.

Water-Reducing Admixtures: If water-reducing admixtures are used they shall conform to ASTM C494, Type A, and contain no more than 1 percent chloride ions.

Calcium Chloride: Calcium chloride is not permitted.

REINFORCING STEEL:

Deformed Bars: ASTM A615, Grade 60. Welding of reinforcing shall not be permitted.

Welded Wire Fabric (WWF): ASTM A185, welded steel wire fabric.

Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcing in place. Use wire bar type supports complying with CRSI recommendations, or approved substitute. Use supports with sand plates or horizontal runners where base material will not support chair legs. Pumice blocks, adobe, bricks, rocks, etc. are not acceptable for rebar or wire mesh supports.

ANCILLARY MATERIALS:

Expansion Joint Filler: ASTM D994, 1/2 inch thick, or as shown.

Nonshrink Grout:

Color: To match concrete.

Manufacturers and Products:

Master Builder Co., Cleveland, OH; Master Flow 928.
Euclid Chemical Co., Cleveland, OH; Hi-flow Grout.

Curing Compound:

Material: Water-based curing compound in accordance with ASTM C309, Type I, Class A, with additional requirement that the moisture loss not exceed 0.035 gram per centimeter squared per 72 hours.

Manufacturers and Products:

Master Builders Co.; Masterkure 200W.
Euclid Chemical Co.; Super Diamond Clear Vox.

Water Stop: Extruded elastomeric plastic compound with basic resin to be polyvinyl chloride.

Manufacturers and Products:

Vinylex Corp., Knoxville, TN; Catalog No. 03250/VIN, RBG-38H.
A. C. Horn, Inc., Beltsville, MD; Catalog No. CSP-162, Type 9 (6-inch by 3/8-inch).

Hydrophilic Water Stop:

Material shall be a non-bentonite hydrophilic rubber compound. Material shall be a combination of chloroprene rubber and chloroprene rubber modified to impart hydrophilic properties.

Manufacturers and Products:

Greenstreak Plastic Products, St. Louis, MO; Hydrotite CJ-1020-K with Leakmaster LV-1 adhesive and sealant.

Adeka Ultra Seal, JLM Associates, Spearfish, SD; MC-2010M with 3M-2141 adhesive and P-201 sealant.

Clear Floor Hardener (Surface-Applied): Colorless, aqueous solution of zinc and magnesium fluosilicate with a minimum 2 pounds of crystals per gallon.

Manufacturers:

Master Builder Co., Cleveland, OH.
A. C. Horn, Inc., North Bergen, NJ.
Sonneborn, Minneapolis, MN.

ABRASIVE NOSING FOR STAIRS

Unless otherwise shown on Drawings, furnish flush type abrasive nosing on stairs.

Nosing Components:

Homogeneous epoxy abrasive, with minimum 50 percent aluminum oxide content, formed and cured upon an extruded aluminum base.

Epoxy abrasive shall extend over and form curved front edge of nosing.

Base of Nosing: Extruded aluminum alloy, 6063-T5, heat-treated.

Anchoring System: Double-set anchors consisting of two rows of integrally extruded anchors.

Size: 3 inches wide by 1/4- to 3/8-inch thick by length as shown.

Color: Selected by ENGINEER from manufacturer's standard color range.

Manufacturers and Products:

Wooster Products, Inc., Wooster, OH; Spectra Type WP3C.

American Safety Tread Co., Inc., Helena, AL; Type FA-311D.

PROPORTIONING AND DESIGN OF MIXES:

Mix Design: Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 318.

Design mixes to provide normal weight concrete with the following specified 28-day compressive strengths, minimum, as indicated on drawings and schedules:

Class 20: 2,000 psi (for conduit encasement).

Class 25: 2,500 psi (not used).

Class 30: 3,000 psi (secondary concrete elements such as curbs, sidewalks, guard posts, fences, posts, and thrust blocks).

Class 40: 4,000 psi (structural concrete).

Class 45: 4,500 psi (truck loading pad).

Class 50: 5,000 psi (not used).

See ACI 301, Chapter 17 for acceptance criteria.

The concrete mix may contain a pozzolan (fly ash). When fly ash is used, the minimum amount shall be 15 percent by weight of the total cementitious materials unless otherwise approved.

Concrete in hard-to-place locations may utilize a high-range water reducer. No other water-reducer shall be used with a high-range water-reducer.

Durability: Concrete, which will be subject to freezing and thawing, weathering, and deicer chemicals, shall be air-entrained and shall have a minimum 28-day compressive strength of 4,500 psi and a maximum water-cement ratio of 0.45. Add air entraining agent (AEA) at the manufacturer's prescribed rate to result in concrete at point of placement having air content complying with ACI 301.

Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

Reinforced Foundations: 3 ±1 inch.

Slabs and Other Structural Concrete: 3-1/2 ±1-1/2 inches.

Red Concrete for Conduit Encasement: Not less than 3 inches and not more than 6 inches.

Maximum slump for concrete using a high-range water-reducer may be increased to 8 inches at point of placement.

MIXING AND DELIVERY:

The manufacture and delivery of all concrete shall conform to ASTM C94 except as modified herein. Hand-mixed concrete is prohibited.

When concrete arrives at the jobsite with slump below that suitable for placing, as indicated by the Specification, water may be added only if the maximum permissible water-cement ratio and the maximum permissible slump is not exceeded. Any water thus added to bring the slump within required limits shall be injected in such a manner that uniformity requirements are met. Water shall be incorporated by additional mixing equal to at least half of the total mixing required or 30 drum revolutions at rated mixing speed, whichever is more. Additional AEA may be introduced during this mixing period if necessary to meet Specifications. Neither water or AEA shall be added to the batch at any later time.

Concrete uniformity shall meet the requirements of ASTM C94 except as modified herein. After final mixing is complete, visible lumps, nonconformance to uniformity requirements, or failure to meet specified slump, entrained air, and temperature requirements shall be considered cause for rejecting the remainder of the load. In addition, failure of the ready-mix truck drum to meet uniformity requirements will be deemed cause for rejection of the mixing equipment until adequate repairs have been made.

Discharge of the concrete shall be completed within 1-1/2 hours, or before the drum has revolved 300 revolutions, whichever comes first, after the introduction of mixing water to the cement and aggregates. The Contractor may extend this 1-1/2-hour limit if the concrete still meets all specified requirements after 1-1/2 hours. (Additional testing to verify conformance to Specifications may be necessary.) In hot weather or under conditions contributing to quick stiffening of the concrete a time limit less than 1-1/2 hours may be designated by the Contractor.

High-range water-reducing admixtures (superplasticizer) shall be added to the mixer at the jobsite, and then be allowed to mix for at least 5 minutes.

Concrete that is rejected for failure to meet any of the above requirements will be evaluated by the Contractor and may be removed and replaced at the expense of the Subcontractor.

Hot or Cold Weather Concreting: Methods and means of batching, mixing, and delivery of concrete in hot or cold weather shall comply with ACI-301 or ACI-306.1.

PART 3--EXECUTION

FORMWORK:

Unless otherwise shown on the drawings, all forms shall be straight and plumb, rigid and mortar tight. All forms shall be braced, tied, and supported sufficiently to maintain their required position during and after the placing of concrete. Joints shall be sufficiently tight to prevent mortar leakage. Where shown on the Drawings, suitable moldings shall be placed in forms to shape edges or surfaces of concrete members. All formwork shall conform to the guidelines in ACI 347.

All exposed corners of concrete shall be chamfered 3/4 inch.

Form Materials:

Use hard plastic finished plywood for exposed areas, and new shiplap or plywood for unexposed areas.

Earth cuts may be used for forming footings.

Form Ties:

Fixed conical or spherical type inserts that remain in contact with forming material and allow for dry packing of form tie holes.

Ties shall withstand pressures and limit deflection of forms to acceptable limits.

Wire ties are not acceptable.

Construction:

In accordance with ACI 347.

Make joints tight to prevent escape of mortar and to avoid formation of fins.

Brace as required to prevent distortion during concrete placement.

On exposed surfaces locate form ties in uniform pattern or as shown.

Construct so ties remain embedded in the wall with no metal within 1-inch of concrete surface when forms, inserts, and tie ends are removed.

Form Removal:

Formwork Not Supporting Weight of Concrete: This formwork may be removed after cumulatively curing at not less than 50 degrees F for 32 hours after placing concrete, provided concrete is sufficiently hard not to be damaged by form removal or subsequent operations. Curing must then continue through the minimum curing period.

Formwork Supporting Weight of Concrete: This formwork may not be removed until concrete has attained its 28-day design compressive strength, except as permitted under "Early Loading of New Concrete" as specified below.

Early Loading of New Concrete: Early loading of concrete structures shall comply with requirements of ACI 318, Section 6.2. When construction loading is proposed before concrete has achieved its 28-day design strength, structural calculations and

concrete strength test data shall be submitted and approved by the BBWI Construction Manager prior to loading.

Form Sealer:

Material: Surface sealer will not bond with, stain, or adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces when applied to most forms or form liners.

Manufacturers and Products:

Master Builders, Inc.; Rheofinish.
Burke Chemicals; Burke Release No. 1.

PLACING REINFORCING STEEL:

Unless otherwise specified, place reinforcing steel in accordance with CRSI Recommended Practice for Placing Reinforcing Bars and ACI 301.

Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full grid plus 2 inches and lace splices with wire of same gage. Fabric shall be supported on metal chairs placed on 8-inch by 8-inch by 22-gage sheet metal base plates and spaced to meet placement tolerance requirements of ACI 318, Chapter 7.

Splices and Laps:

Top Bars: Horizontal bars placed such that 12 inches of fresh concrete is cast below in single placement.

Horizontal wall bars are considered top bars.

Lap bars as specified in Construction Drawings and in ACI 318, Chapters 7 and 12. Unless otherwise indicated, all splices shall be Class B tension splices.

Tie splices with 18-gauge annealed wire as specified in CRSI Standard.

ABRASIVE NOSINGS

Provide abrasive nosings on concrete steps not being supplied or coated with another type of nosing or nonskid material.

PLACING CONCRETE:

Place concrete in accordance with ACI 301.

Prior to placing concrete, remove water from excavation and debris and foreign material from forms. Check reinforcing steel for proper placement and correct discrepancies.

Before depositing new concrete on old concrete, clean surface using sandblast or bushhammer or other mechanical means to obtain a 1/4-inch rough profile, and pour a cement-sand grout to minimum depth of 1/2-inch over the surface. Proportion 1 part cement to 2.5 parts sand by weight.

Place concrete as soon as possible after leaving mixer, without segregation or loss of ingredients, without splashing forms or steel above, and in layers not over 2 feet deep. Place within 1-1/2 hours after adding cement to mix.

8 feet maximum vertical drop to final placement, when not guided with chutes or other devices to prevent segregation due to impact with reinforcing.

Cold Weather Placing: Protect concrete work from damage or reduced strength which could be caused by frost, freezing, or low temperatures, in compliance with ACI 306.1 and as specified herein. Minimum concrete temperature as placed and maintained shall be 55 degrees F, or as required by ACI-306.1, Table 3.2.1.

Hot Weather Placing: When hot weather conditions that would seriously impair quality and strength of concrete exist, place concrete in compliance with ACI 305 and as specified herein:

Cool mixing drum and/or ingredients before mixing to maintain concrete temperature below 95 degrees F at time of placement.

COMPACTION:

Vibrate concrete as follows:

Apply approved vibrator at points spaced not farther apart than vibrator's effective radius.

Apply close enough to forms to vibrate surface effectively but not damage form surfaces.

Vibrate until concrete becomes uniformly plastic.

Vibrator must penetrate fresh placed concrete and into previous layer of fresh concrete below.

CONSTRUCTION JOINTS:

Locate as shown or as approved.

Provide waterstops in construction joints as indicated.

Maximum Spacing Between Construction Joints: 40 feet.

INSTALLATION OF EMBEDDED ITEMS:

Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by cast-in-place concrete. Secure all such items firmly in position.

FINISHING:

Floor Slabs and Tops of Walls:

Finish slabs to grades shown on Drawings.

Screed surfaces to true level planes.

After initial water has been absorbed, float with wood float and trowel with steel trowel to smooth finish free from trowel marks.

Do not absorb wet spots with neat cement.

Unexposed Slab Surfaces: Screed to true surface, bull float with wood float, and wood trowel to seal surface. Finish surfaces to grades shown on Drawings.

Tolerances: Floors shall not vary from level or true plane more than 1/4-inch (plus or minus) in 10 feet when measured with a straightedge. Floors shall conform to grades shown on Drawings.

Exterior Slabs and Sidewalks:

Bull float with wood float, wood trowel, and lightly trowel with steel trowel.

Finish with broom to obtain nonskid surface.

Finish exposed edges with steel edging tool.

Mark walks transversely at 5-foot intervals with jointing tool.

FINISHING AND PATCHING FORMED SURFACES:

Smooth Form Finish (SmFm): Provide as-cast smooth form finish for formed concrete surfaces that are exposed to view, or that are covered with a coating material applied directly to concrete, or a covering material bonded to concrete such as waterproofing, dampproofing, painting, or other similar system.

Produce smooth form finish (SmFm) by selecting form material to impart a smooth, hard, uniform texture and arranging them orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.

Cut out honeycombed and defective areas.

Cut edges perpendicular to surface at least 1-inch deep. Do not feather edges. Soak area with water for 24 hours.

Patch with nonshrink grout.

Finish surfaces to match adjacent concrete.

Keep patches damp for minimum 7 days or spray with curing compound to minimize shrinking.

Fill form tie holes with Nonshrink Grout.

CONCRETE PROTECTION AND CURING:

General: Protect freshly placed concrete from injurious action by sun, rain, wind, flowing water, mechanical injury, and premature drying for not less than seven (7) consecutive days after placement.

Protect concrete against damage from frost or freezing for a minimum of 3 days. Provisions of ACI 306.1 shall apply for cold weather unless otherwise specified.

Remove and replace concrete damaged by freezing.

Curing Methods: Perform curing of concrete by one or more of the following methods:

Moist Curing: Cover concrete surfaces with moisture retaining cover for curing period. Exposed horizontal concrete surfaces may be covered with sand or other approved material and kept wet for the required period. Wood forms shall be kept sufficiently wet at all times to prevent the forms from separating at the joints and the concrete from drying.

Membrane Curing: Concrete surfaces to receive membrane curing shall be treated with a curing compound as specified or otherwise approved. The curing compound shall be applied in strict accordance with the directions of the manufacturer of the compound.

Temperature, Wind, and Humidity:

Cold Weather: When the mean daily outdoor temperature is less than 40 degrees F, the temperature of the concrete surface shall be maintained between 55 and 90 degrees F for the required curing period. When necessary, arrangements for heating, covering, insulating, or housing the concrete work shall be made in advance of placement and shall be adequate to maintain the required temperature without injury due to concentration of heat. Combustion heaters shall not be used during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases that contain carbon dioxide. If early loading is anticipated during cold weather, provide temperature protection to ensure necessary strength development.

The concrete surface temperature requirements (based on section thickness) in ACI 306.1 may be used in lieu of the 55 degrees F minimum specified before.

If concrete surface temperatures as measured by the inspecting agency are below the minimum curing temperature but meet the freeze protection requirements, the concrete curing period shall be extended to ensure adequate strength is developed. The extension time shall be at least equivalent to the time period in which temperatures were too low.

Hot Weather: The concrete surfaces shall be kept below 100 degrees F for the curing period. When necessary, provision for windbreaks, shading, fog spraying, sprinkling, ponding, or wet covering with a light colored material shall be made in advance of placement, and such protective measures shall be taken as quickly as concrete hardening and finishing operations will allow.

Rate of Temperature Change: Changes in temperature of the air immediately adjacent to the concrete during and immediately following the curing period shall be kept as uniform as possible and shall not exceed 5 degrees F in any 1-hour or 50 degree F in any 24-hour period.

Use curing compound only where approved by Construction Manager. Cure formed surfaces with curing compound applied in accordance with manufacturer's directions as soon as forms are removed and finishing is completed.

WATER STOPS: PLASTIC AND HYDROPHILIC:

Install in accordance with manufacturer's instructions.

FLOOR HARDENER:

Use where noted or scheduled.

Follow manufacturer's application instructions.

END OF SECTION 03301

SECTION 07210--BUILDING INSULATION

PART 1--GENERAL

REFERENCES:

The following is a list of standards which may be referenced in this section:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C578	Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
ASTM C665	Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
ASTM D4397	Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.

MATERIAL STORAGE:

Store off ground and keep dry at all times. Protect against weather condensation and damage.

PART 2--PRODUCTS

MATERIALS:

Mineral/Glass Fiber Blanket/Batt Insulation: ASTM C665, Type III, Class B, fiberglass batts with aluminum foil vapor retarder; R-value on Drawings.

Rigid Insulation: ASTM C578, Type IV, extruded polystyrene; R-value as shown.

Vapor Retarder: ASTM D4397 plastic sheeting, 6 mils minimum.

PART 3--EXECUTION

INSTALLATION:

Batt Insulation:

Install in accordance with the manufacturer's instructions.

Fasten flanges to the sides of framing members with the vapor retarder facing the warm side. Fit tightly to ensure a continuous seal.

Where electrical outlets, ducts, pipes, vents, or other utility items occur, place insulation on the cold weather side of the obstruction.

Provide fasteners, adhesive, tape, and sealant as recommended by insulation manufacturer.

Vapor Retarder:

Apply to exterior wall and ceiling framing in sheets as large as possible, lapping all joints 6 inches and sealing with sealant and tape recommended by manufacturer.

Fit tightly and seal around all penetrations.

Replace torn and punctured sheets.

Repair minor tears or holes with tape.

Repair by replacement major tears or holes that require more than a 6-inch length of tape to repair.

Rigid Insulation:

Install with fasteners or adhesive recommended by manufacturer.

Butt joints tightly together.

Where thicker than 2 inches, install in two layers, staggering all joints.

CLEANUP AND PROTECTION:

Remove from site all containers, wrappings, and scrap insulation material. Leave floors broom clean.

Protect installed insulation from tears or other damage until covered with finish material. Replace damaged material.

END OF SECTION 07210

SECTION 10440--LETTERS

PART 1--GENERAL

SUMMARY:

Provide and install the letters shown for the Crest Pad Buildings as specified in these Specifications.

SEQUENCING/SCHEDULING:

Install letters before insulating wall behind them. This will allow fastening of studs through metal panels and nuts behind.

WARRANTY:

Guarantee baked enamel finish for 5 years against cracking, peeling, and discoloration.

PART 2--PRODUCTS

MANUFACTURERS:

Subject to compliance with requirements, provide products of one of the following:

Andco Industries Corp., 4615 Sellars Ave., Greensboro, NC 27407.
Metal Arts, 410 6th Street SE, PO Box 639, Mandan, ND 58554.
The Southwell Co., Box 299, San Antonio, TX 78291-0299.

MATERIALS:

Letter Style: Microgramma Bold.

Material: 1/2-inch plate aluminum.

Letter Size: Height top be determined by BBWI Construction Manager; 1/2-inch depth.

Copy and Design: Affix to Landfill and Evaporation Pond Crest Pad Building at locations determined by BBWI Construction Manager. Building letter designation are the following:

Evaporation Pond Crest Pad Building: CPP-1798.
Landfill Crest Pad Building: CPP-1799.

Finish: Baked enamel. Color shall be black.

PART 3--EXECUTION

INSTALLATION/APPLICATION/ERECTION:

Install as per manufacturer's instructions using a concealed fastener method. Letters shall project 1-1/2 inches from wall panels.

END OF SECTION 10440

SECTION 11312--LEACHATE PUMPS

PART 1--GENERAL

GENERAL:

Provide multi-stage, centrifugal, submersible pumps specifically designed for landfills and sideslope installations. Pumps shall be designed for pumping contaminated water and leachate. Provide all necessary pump appurtenances including lifting cable for lowering and removing the pump, power cable, vents, transducer and transducer lead, a minimum 4-wheel system at each end of the pump specifically designed for transporting the pump in HDPE butt-fused carrier pipe, outlet pipe attachments and flex hose as necessary, and all other fittings or accessories required for a complete and fully functional installation.

The pump and all associated appurtenances shall be designed by the pump manufacturer to operate as a fully functional and reliable pump system. Provide a pump system capable of operating unattended with a high degree of reliability with multiple cycles per day.

Provide vent valve system, if necessary, to purge air from pumps to prevent pump air lock. Vacuum air release valves are provided in system piping at top of riser.

Provide quick-couple fitting at end of pump where outlet pipe attaches.

Remove pump discharge check valve to prevent water from accumulating above pump outlet. Pump shall be fully capable of operating with check valve removed. Pump shall have a transmitter mounted at the center bottom for liquid level control.

Provide stainless steel tag numbers and mounting fasteners and engrave with the equipment number for each pump.

Note that pump control will be accomplished through software programming and the PLC mounted in the system control panels (by others) located in each Crest Pad Building.

PART 2--PRODUCTS

PUMPS:

All major components shall be Type 304 stainless steel including the housing, fasteners, shaft, diffuser chamber, and impeller(s). Components shall be highly corrosion resistant and suitable for contaminated water and leachate service. Gaskets, O-rings, and seals shall have compatibility properties equivalent to Viton material as a minimum.

Pump bearings shall have better heat and wear resistance than Teflon bearings.

Provide power, transducer, and stainless steel cable as recommended by manufacturer and to the length and configuration as shown on the Drawings.

Motors:

Provide hermetically sealed pump motors suitable for continuous submerged service. Provide continuous motor leads without splices along the full length of the carrier pipe. Leads shall be fully insulated with chemical and waterproof insulation properties. Provide motor designed for continuous duty and multiple cycle times per hour. Motors shall have thermal overload protection.

Source Quality Control:

Inspect control panels for required construction, electrical connection, and intended function.

Factory Tests and Adjustments: Test all equipment and control panels actually furnished.

Factory Test Report: Include test data sheets, curve test results, performance test logs.

Functional Test: Perform manufacturer's standard test on equipment. Include vibration test, as follows:

Dynamically balance rotating parts of each pump and its driving unit before final assembly.

Limits:

Complete Rotating Assembly Including Coupling, Drive Unit, and Motor: Less than 90 percent of limits established in the Hydraulic Institute Standards.

Performance Test:

Conduct on each pump.

Perform under simulated operating conditions.

Test for a continuous 3-hour period without malfunction.

Test Log: Record the following:

Total head.

Capacity.

Flow measured by factory instrumentation and storage volumes.

Average distance from suction well water surface to pump discharge centerline for duration of test.

Pump discharge pressure converted to feet of liquid pumped and corrected to pump discharge centerline.

Field head.

Driving motor voltage and amperage measured for each phase. Power consumption in watts

Adjust, realign, or modify units and retest if necessary.

Hydrostatic Tests: Pump casing(s) tested at 150 percent of shutoff head. Test pressure maintained for not less than 5 minutes.

FLOW METERS:

Provide flow meters in locations shown on the drawings and as listed herein. Flow meters shall be paddlewheel–type and shall have the following features:

Sensors:

Dual magnet to assure unimpeded operation of the paddlewheel.

Mount shall be configured to provide maximum accuracy.

Linear sensor response with a repeatability factor of plus or minus 5 percent.

Standard Features:

Flow indicating transmitter (FIT) mounted locally with interconnecting cabling between FIT and flow element.

Each meter shall have a bi-directional, 8-digit flow totalizer with LCD screen and 3/4-inch digits.

Full programmability for ease of calibration to line size and change in units. Programming shall be menu driven.

Non-Volatile memory to retain programmed settings and totalized flow when power is disconnected.

Temperature range between 0 and 55 degrees C.

Provide flow meters with integrated piping providing proper upstream and downstream distances (10 diameters and 5 diameters respectively) and flanged ends. Piping shall be Schedule 80 PVC. Provide all necessary parts and appurtenances to allow a complete installation into the connecting piping shown on the Drawings.

Provide flow meters for the following locations:

Location or Service Type	Quantity	Nominal Line Size (in.)
Landfill Crest Pad Bldg:		
Cell 1 LCRS Low Flow Pump	1	3/4"
Cell 1 LCRS High Flow Pump	1	1-1/2"
Cell 1 LDRS, SLDRS	2	3/4"
Evaporation Ponds Crest Pad Bldg:		
Evaporation Pond LDRS (east, west)	2	3/4"
Combined Sump Pump	1	3/4"
SSSTF (2" SW)	1	1-1/2"
Truck Loading Station (to/from)	2	1-1/2"
Raw Water	1	1-1/2"

LEVEL SENSORS

Provide level sensors integral to each leachate pump (6 total) as shown on the Drawings. Level elements shall be designed and constructed for landfill leachate service, i.e., fully submersible and chemically resistant.

The level sensor shall include a transmitter with built-in temperature compensation and an accuracy of plus or minus 1.0 percent. Sensor output shall be a conditioned compensated 4 to 20 mA signal.

The sensor control cable shall be shielded to prevent signal disruption and include a vent tube for atmospheric pressure compensation. Control cables shall include polyurethane jacket and Kevlar tension members.

Level sensors shall be mounted on the pump housing and be field serviceable without having to disassemble the pump.

PART 3--EXECUTION

INSTALLATION:

Install in accordance with manufacturers' printed instructions and manufacturers' representatives' guidance and recommendations.

FIELD QUALITY CONTROL:

Test the insertion and extraction of each pump from the carrier pipe and into the crest pad buildings. Verify that the pumps return to the correct location in the sumps upon re-insertion into the carrier pipe. Perform testing while the perforated carrier pipe sections in the sumps are exposed to allow observation of the pump removals and insertions from the carrier pipe.

Test the pumps by flooding the sump locations with clean water. Run the pumps at full output for a period of not less than 1 hour. Record flows and pressures. Keep the sumps flooded to supply adequate water to the pumps during the pump test.

SUPPLEMENTS:

The supplements listed below, following "END OF SECTION," are a part of this Specification.

Data Sheets:

Supplement 1—Leachate Pump Data Sheet, 11312-01.
Supplement 2—Leachate Pump Data Sheet, 11312-02.
Supplement 3—Leachate Pump Data Sheet, 11312-03.
Supplement 4—Leachate Pump Data Sheet, 11312-04.

END OF SECTION 11312

LEACHATE PUMP DATA SHEET, 11312-01:

Tag Numbers: _____

Pump Locations and I.D.: Cell 1 LCRS Sump, Low Flow. P-CD-203-2
Cell 1 LDRS Sump. P-CD-204
Cell 1 SLDRS Sump. P-CD-208

Manufacturer and Model Number: (1) EPG Companies WSD1.5-3
(2) or equal

SERVICE CONDITIONS

Liquid Pumped (Material and Percent): Leachate from hazardous and low-level radioactive waste landfill

Pumping Temperature (Fahrenheit): Normal: 55 F Max: 130 F Min: 27 F

Specific Gravity at 60 Degrees F: 1.0 Viscosity Range: NA pH: 5-9

Abrasive (Y/N) Y (infrequent fine soil particles) Possible Scale Buildup (Y/N): Y

Total Suspended Solids (mg/l): 200 (estimated)

PERFORMANCE REQUIREMENTS AT PRIMARY DESIGN POINT

Capacity (US gpm): Rated: 6.9

Total Dynamic Head (Ft): Rated: 49

Min. Hydraulic Efficiency (%): 60%

Maximum Shutoff Pressure (Ft): 80

Max. Pump Speed at Design Point (rpm): 3,450

Constant (Y/N): Y Adjustable (Y/N): N

DESIGN AND MATERIALS

Design: Wheeled enclosure frame Back Pullout (Y/N) Y

Discharge Orientation: Center

Casing Materials: Type 304 SST

Case Wear Ring (Y/N) NA Material: _____

Impeller: Type: Closed Material: Type 304 SST

Impeller Wear Ring (Y/N): Y Material: E-Glide (engineered plastic) or equal

Shaft Material: Type 304 SST Shaft Sleeve Material: E-Glide or equal

Shaft Seal: Y Ring Material: E-Glide or equal Lubrication: Fluid

AFBMA B-10 Bearing Life (Hrs): NA Lubrication: NA

Drive Type: Direct Coupled

DRIVE MOTOR

Horsepower: 0.5 Voltage: 460 Phase: 3

Synchronous Speed (rpm): 3,450

Service Factor: 1.6 Inverter Duty (Y/N) NA

Motor nameplate horsepower shall not be exceeded at any head-capacity point on the pump curve.

Enclosure: SUBM Y

LEACHATE PUMP DATA SHEET, 11312-02:

Tag Numbers: _____

Pump Location and I.D.: Cell 1 LCRS Sump, High Flow. P-CD-203-1

Manufacturer and Model Number: (1) EPG Companies 17-2
(2) _____

SERVICE CONDITIONS

Liquid Pumped (Material and Percent): Leachate from hazardous and low-level radioactive waste landfill

Pumping Temperature (Fahrenheit): Normal: 55 F Max: 130 F Min: 27 F

Specific Gravity at 60 Degrees F: 1.0 Viscosity Range: NA pH: 5-9

Abrasive (Y/N) Y (infrequent fine soil particles) Possible Scale Buildup (Y/N): Y

Total Suspended Solids (mg/l): 200 (estimated)

PERFORMANCE REQUIREMENTS AT PRIMARY DESIGN POINT

Capacity (US gpm): Rated: 82

Total Dynamic Head (Ft): Rated: 72

Min. Hydraulic Efficiency (%): 60%

Maximum Shutoff Pressure (Ft): 220

Max. Pump Speed at Design Point (rpm): 3,450

Constant (Y/N): Y Adjustable (Y/N): N

DESIGN AND MATERIALS

Design: Wheeled enclosure frame (Y/N) Y

Discharge Orientation: Center

Casing Materials: Type 304 SST

Case Wear Ring (Y/N) NA Material: _____

Impeller: Type: Closed Material: Type 304 SST

Impeller Wear Ring (Y/N): _____ Material: _____

Shaft Material: Type 304 SST Shaft Sleeve Material: E-Glide (engineered plastic or equal

Shaft Seal: Y Ring Material: E-Glide or equal Lubrication: Fluid

AFBMA B-10 Bearing Life (Hrs): NA Lubrication: NA

Drive Type: Direct Coupled Other: _____

DRIVE MOTOR

Horsepower: 3.0 Voltage: 460 Phase: 3

Synchronous Speed (rpm): 3,450

Service Factor: 1.15 Inverter Duty (Y/N) NA

Motor nameplate horsepower shall not be exceeded at any head-capacity point on the pump curve.

Enclosure: SUBM Y

LEACHATE PUMP DATA SHEET, 11312-03:

Tag Numbers: _____

Pump Locations and I.D.: Evaporation Pond LDRS Pump (East Pond). P-CD-201
Evaporation Pond LDRS Pump (West Pond). P-CD-202

Manufacturer and Model Number: (1) EPG Companies WSD2-2/1
(2) _____

SERVICE CONDITIONS

Liquid Pumped (Material and Percent): Leachate from hazardous and low-level radioactive waste landfill

Pumping Temperature (Fahrenheit): Normal: 55 F Max: 130 F Min: 27 F

Specific Gravity at 60 Degrees F: 1.0 Viscosity Range: NA pH: 5-9

Abrasive (Y/N) Y (infrequent fine soil particles) Possible Scale Buildup (Y/N): Y

Total Suspended Solids (mg/l): 200 (estimated)

PERFORMANCE REQUIREMENTS AT PRIMARY DESIGN POINT

Capacity (US gpm): Rated: 12

Total Dynamic Head (Ft): Rated: 11

Min. Hydraulic Efficiency (%): 60%

Maximum Shutoff Pressure (Ft): 220

Max. Pump Speed at Design Point (rpm): 3,450

Constant (Y/N): Y Adjustable (Y/N): N

DESIGN AND MATERIALS

Design: Wheeled enclosure frame (Y/N) Y

Discharge Orientation: Center

Casing Materials: Type 304 SST

Case Wear Ring (Y/N) NA Material: _____

Impeller: Type: Closed Material: Type 304 SST

Impeller Wear Ring (Y/N): _____ Material: _____

Shaft Material: Type 304 SST Shaft Sleeve Material: E-Glide (engineered plastic or equal

Shaft Seal: Y Ring Material: E-Glide or equal Lubrication: Fluid

AFBMA B-10 Bearing Life (Hrs): NA Lubrication: NA

Drive Type: Direct Coupled Other: _____

DRIVE MOTOR

Horsepower: 0.5 Voltage: 460 Phase: 3

Synchronous Speed (rpm): 3,450

Service Factor: 1.15 Inverter Duty (Y/N) NA

Motor nameplate horsepower shall not be exceeded at any head-capacity point on the pump curve.

Enclosure: SUBM Y

LEACHATE PUMP DATA SHEET, 11312-04:

Tag Numbers: _____

Pump Location and I.D.: Evaporation Pond Transfer Pump. P-CD-209

Manufacturer and Model Number: (1) EPG Companies 17-1
(2) _____

SERVICE CONDITIONS

Liquid Pumped (Material and Percent): Leachate from hazardous and low-level radioactive waste landfill

Pumping Temperature (Fahrenheit): Normal: 55 F Max: 130 F Min: 27 F

Specific Gravity at 60 Degrees F: 1.0 Viscosity Range: NA pH: 5-9

Abrasive (Y/N) Y (infrequent fine soil particles) Possible Scale Buildup (Y/N): Y

Total Suspended Solids (mg/l): 200 (estimated)

PERFORMANCE REQUIREMENTS AT PRIMARY DESIGN POINT

Capacity (US gpm): Rated: 120

Total Dynamic Head (Ft): Rated: 15

Min. Hydraulic Efficiency (%): 60%

Maximum Shutoff Pressure (Ft): 220

Max. Pump Speed at Design Point (rpm): 3,450

Constant (Y/N): Y Adjustable (Y/N): N

DESIGN AND MATERIALS

Design: Wheeled enclosure frame (Y/N) Y

Discharge Orientation: Center

Casing Materials: Type 304 SST

Case Wear Ring (Y/N) NA Material: _____

Impeller: Type: Closed Material: Type 304 SST

Impeller Wear Ring (Y/N): _____ Material: _____

Shaft Material: Type 304 SST Shaft Sleeve Material: E-Glide (engineered plastic or equal

Shaft Seal: Y Ring Material: E-Glide or equal Lubrication: Fluid

AFBMA B-10 Bearing Life (Hrs): NA Lubrication: NA

Drive Type: Direct Coupled Other: _____

DRIVE MOTOR

Horsepower: 1.5 Voltage: 460 Phase: 3

Synchronous Speed (rpm): 3,450

Service Factor: 1.15 Inverter Duty (Y/N) NA

Motor nameplate horsepower shall not be exceeded at any head-capacity point on the pump curve.

Enclosure: SUBM Y

SECTION 13122--METAL BUILDING SYSTEMS

PART 1--GENERAL

WORK INCLUDED:

The Construction Subcontractor shall furnish and install a prefabricated pre-engineered metal building, complete, as shown on the subcontract drawings and as specified herein.

REFERENCES:

The following Codes and Standards, including others referenced therein, form a part of this Section to the extent specified herein:

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC	Specification for Structural Steel for Buildings – Allowable Stress Design (ASD).

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI	Specification for the Design of Cold-Formed Steel Structural Members.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A36	Standard Specification for Carbon Structural Steel.
ASTM A53	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
ASTM A325	Standard Specification for Structural Bolts, Steel, Heat-Treated, 120/105 ksi Minimum Tensile Strength.
ASTM A500	Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
ASTM A501	Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
ASTM A529	Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
ASTM A570	Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality.
ASTM A572	Standard Specification for High-Strength, Low-Alloy Columbium-Vanadium Structural Steel.

ASTM A607	Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Columbium or Vanadium, or Both, Hot-Rolled, and Cold-Rolled.
ASTM F959	Standard Specification for Compressible-Washer-Type Direct Tension Indicator for Use with Structural Fasteners.

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1	Structural Welding Code – Steel.

METAL BUILDING MANUFACTURERS ASSOCIATION (MBMA)

Recommended Design Practices Manual, for applicable loads and load combinations.

Metal Building Systems Manual, for collateral loads.

IDAHO NATIONAL ENGINEERING AND ENVIRONMENTAL LABORATORY (INEEL)

INEEL Welding Manual.

INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS (ICBO)

UBC, Uniform Building Code.

STEEL DOOR INSTITUTE (SDI)

SDI 100	Recommended Specifications for Standard Steel Doors and Frames.
SDI 117	Manufacturing Tolerances Standard Steel Doors and Frames.

SUBMITTALS:

Submittals shall be as follows:

Shop Drawings: Submit shop drawings on the pre-engineered building completely detailing all major trusses (if any), rigid frames, purlin/girt locations, columns, wall panels, roof panels, ceiling panels, windows, doors, base plates, anchor bolts, anchor bolt locations, portal frame locations, rain gutters, downspouts, flashings and wall base conditions, and any other graphic information and material specification required to evaluate the complete structure including all dimensions. Drawings shall be stamped by a registered Professional Engineer licensed to practice in the State of Idaho.

Design Calculations: Submit design calculations showing all loads specified. Design calculations shall be stamped by a registered Professional Engineer licensed to practice in the State of Idaho.

Certification: Submit certification that panels and accessories have been installed in accordance with the manufacturer's specifications.

QUALIFICATIONS:

Provide prefabricated metal buildings as produced by a manufacturer who is regularly engaged in fabrication of pre-engineered metal structures of type and quality indicated. All components shall be provided from one manufacturer.

WARRANTIES:

The roofing and siding shall be warranted for a minimum of 20 years against wind damage, leakage, paint fade, chipping, peeling, attachment and rusting. Warranty shall include labor and materials for replacement of defective panels. Warranty shall not be pro-rated over 20-year period.

PART 2--PRODUCTS

MANUFACTURER:

Building shall be as manufactured by CECO Buildings Division, or approved equal. Design details, dimensions, and sizes are based on a CECO building. If an "or equal" is submitted, all CECO dimensions and clearances shall be taken as minimums for evaluation of submittal. Construction Subcontractor shall be responsible for all adjustments required to plans as a consequence of changing building manufacturer. Subcontractor shall provide calculations on sizes and number of anchor bolts required to develop building reactions. All calculations, shop drawings and special process procedures as welding, painting and structural bolting, shall be submitted for approval and shall be stamped by a registered professional engineer licensed to practice in the State of Idaho.

Type: The metal building shall be a prefabricated, weather-tight, free-standing building having a structural steel frame. The building shall be a braced frame system. The roof slope and the eave height shall be at as specified on Construction Drawings.

DESIGN LOADS:

The building shall be designed for the following applied loads in addition to dead load:

Vertical Live Loads: Roof covering shall be designed for either 20 psf uniformly distributed or a 200-pound concentrated load (over a 1- by 1-foot area) located at center of maximum roofing span.

All other building components shall be designed for a 30-psf snow load, with an allowance for ice buildup at the eaves.

Wind Loads: The wind load on the structure shall be designed for a 70-mph wind speed, calculated according to the UBC exposure Class "C" with an Importance Factor = 1.15.

Seismic Loads: Seismic loads shall be determined and applied in accordance with the UBC Zone 3, Importance Factor = 1.25. Out-of-plane system stability, nonstructural components, and equipment shall be evaluated using UBC 1632.

Auxiliary Loads: All dynamic live loads required by the contract document, such as cranes, material handling systems, and vibrating equipment.

Collateral Loads: All additional dead loads, other than the weight of the metal building system, such as fire sprinklers, mechanical HVAC systems, electrical systems, and ceilings. Collateral loads shall be a minimum of 10 pounds per square foot as defined in the Metal Building Systems Manual published by the MBMA.

Maximum Deflection: Deflection shall be limited to L/240 for all building components.

Combination of Loads: The combining of normal loads, auxiliary loads and collateral loads for design purposes shall be as prescribed and recommended by the MBMA "Recommended Design Practices Manual."

Building Code Requirement: Design building, roof system, roof overhang including support framing, roof and wall panels, and fasteners for horizontal and uplift wind loads and earthquake forces to meet UBC.

MATERIALS:

Hot-Rolled Structural Shapes: Conform to ASTM A36 or A529.

Tubing or Pipe: Conform to ASTM A500, Grade B; ASTM A501, or ASTM A53.

Members Fabricated from Plate or Bar Stock: 42,000 psi minimum yield strength; Conform to ASTM A529, A570, or A572.

Members Fabricated by Cold Forming: Conform to ASTM A607, Grade 50.

Galvanized Steel Sheet: Conform to ASTM A446 with G90 coating. "Class" to suit building manufacturer's standards.

STRUCTURAL FRAMING COMPONENTS:

Rigid Frames:

Rigid frames shall be hot-rolled structural steel, factory welded, and shop painted. Furnish complete with attachment plates, bearing plates, and splice members. Factory drilled for bolted field assembly.

Length of span and spacing of frames shall be as shown on Drawings except slight roof slope variations are acceptable to meet manufacturer's standard.

End Wall Columns: End walls shall be framed with interior bay columns and trusses to allow future expansion capability.

Wind Bracing: No "x" type rod bracing shall be used in bays where bracing would cross windows or door openings, or where the interior of the exterior walls are to be finished. Use portal frames where bracing is required at window or door openings.

Secondary Framing: Purlins, eave girts, girts, flange and sag bracings shall be "Z" or "C" roll formed sections no pre-punched for fasteners, and shall be shop prime painted. Roof purlins shall be spaced a maximum of 5-foot 0-inch O.C. Base channel, sill angle, purlin spacers; minimum 14-gauge cold-formed steel; and shall be shop prime painted.

Anchor Bolts: The anchor bolts for the rigid frames shall be designed by the pre-engineered building manufacturer. Location and placement shall be coordinated with the foundation rebar shown on the Drawings. Any changes in rebar placement shall be brought to the attention of the Construction Subcontractor and engineering calculations shall be provided taking into account the changed rebar location.

Bolts: Bolts shall be ASTM A325 in quantities necessary for design loads and connection details. Provide zinc- or cadmium-plated units when in direct contact with panels. Direct tension indicators shall conform to ASTM F959.

Fabrication:

Shop fabricate to the indicated size and section, complete with base plates, bearing plates, and other plates as required for erection, welded in place, and with all required holes for anchoring or connections shop drilled or punched to template dimensions.

Shop connections shall be power riveted, bolted, or welded.

Field connections shall be bolted. Install high strength threaded fasteners in accordance with "Specifications for Structural Joints Using ASTM A325 or A490 Bolts."

Weld Construction:

Comply with AWS D1.1 and the INEEL Welding Manual for procedures, appearance and quality of welds, and methods used in connecting welding work.

Shop Painting:

Surfaces to be primed shall be cleaned of loose mill scale, rust, dirt, oil, grease, and other matter precluding paint bond. Follow procedures of SSPC-SP3 for power tool cleaning, SSPC-SP7 for brush-off blast cleaning, and SSCP-SP1 for solvent cleaning.

Prime structural steel primary and secondary framing members with manufacturer's standard rust-inhibitive primer having over 50 percent rust-inhibitive pigment, such as organic zinc. No lead or chromate will be allowed.

Prime galvanized members, after phosphoric acid pretreatment, with zinc dust-zinc oxide primer.

ROOFING AND SIDING:

General: Provide roofing and siding sheets formed to general profile or configuration as specified. Provide flashings, closers, fillers, metal expansion joints, ridge covers, and other sheet metal accessories, factory formed of same material and finish as roofing and siding.

Roof Panels:

The Interlocking-Standing Seam Roof Covering shall carry an Underwriters' Laboratories, Inc., Uplift Classification of not less than Class 90 and shall consist of material not less than 24-gauge aluminized coated steel. The panels shall be installed with the ribs upstanding and parallel to the roof slope. The panels shall be Guardian I, Galvalume in color, with thermal spacers as manufactured by United Structures of America (U.S.A.), or approved equal.

All longitudinal interlocking ribs as well as any transverse end laps shall be properly sealed, according to the manufacturer's instructions, with non-drying sealant.

The roof panels shall be secured to each structural support by a steel clip concealed between the adjacent male and female ribs and fastened under that panel's weather surface. Clip shall be long enough to allow Styrofoam thermal spacer on top of purlin.

Penetrations through the roof panel by fasteners shall be limited to only those required at the rake eaves, at end laps and at the ridge. All exposed fasteners shall be fitted with weather-seal washers of hydrocarbon-based elastomer (synthetic rubber) with a compatible metal backing.

Thermal (break) spacers shall be provided continuously at each structural support to minimize thermal conductivity. The thermal spacer shall be a continuous Styrofoam strip, 3 inches by 1 inch thick.

Wall Panels Exterior:

The interlocking-ribbed wall covering shall consist of 16-inch wide embossed panels, of not less than 24 U.S. gauge fluoropolymer enamel coated steel with approximately 3-inch deep male and female ribs. The panels shall be Shadowrib as manufactured by MBCL, or approved equal. The wall panels shall be applied to the structural framing with the interlocking ribs toward the interior of the structure. The interlocking ribs shall be secured 16 inches O.C. at the base, at each intermediate girt and the support at which it terminates by means of an interior fastener, thus eliminating any through-wall fastening.

All interior fasteners, i.e., screws, bolts and nuts, etc., shall be of carbon steel having a protective coating of either zinc or cadmium.

Interior Liner Panels: Interior wall liner panels shall be provided throughout the building on all perimeter walls. The panels shall be CECO "SOP" (soffit panels), 24 gauge, white with concealed fasteners, or approved equal. All panel joints shall be provided with sealer along the edges of each panel. The liner panels shall function as a vapor barrier. Length of panels shall be full height with no horizontal joints. finish shall be as described below.

Sealing Tape: Sealing tape shall be 100 percent solids, pressure sensitive grey polyisobutylene compound tape with release paper backing. Not less than 1/2 inch wide and 1/4 inch thick, nonsag, nontoxic, nonstaining and permanently elastic.

Joint Sealant: Joint sealant shall be one-part elastomeric; polyurethane, polysulfide, or silicon rubber as recommended by building manufacturer.

Ice Stops: Provide ice stops to prevent snow and ice damage to gutters. Ice stops shall be "ICEJAX" as manufactured by Snowjax Inc., Mechanicsburg, Pennsylvania, or approved equal. "ICEJAX" shall be adhered with Loctite "Depend", or approved equal, to metal roof panels.

Rain Gutter and Downspouts: The rain gutter shall be continuous along the eaves of the building. The gutter shall be a surface mounted type with downspout size and number as called for by the building manufacturer or as shown on the drawings. Gutter shall be minimum 7 x 7 inches in cross section. Gutter and downspouts shall be standard design as manufactured by Metal Building Manufacturer, or approved equal. Gutter shall be installed with 1/4 inch per 10-foot 0-inch slope to downspout.

DOORS:

Steel Doors: 1-3/4-inch doors, conforming to ANSI/SDI 100, with manufacturer's standard core, except provide cores in exterior doors with rigid polyurethane cores. Provide exterior doors with top and bottom edges finished flush. Provide doors of materials and ANSI/SDI 100 grades and models specified below, or as indicated on drawings and schedules.

Exterior Doors: Unless otherwise indicated, Grade III, extra heavy duty, Model 2 (seamless) design), minimum 16 gauge galvanized steel sheet faces.

DOOR FRAMES:

Provide metal frames for doors and other openings according to ANSI/SDI 100 and of types and styles as shown on drawings and schedules. Conceal fastenings unless otherwise indicated. Frames shall be No. 16 USS gage or heavier cold-rolled steel sheet. Form exterior frames of hot dip galvanized steel. Fabricate frames with mitered and welded corners.

Available manufacturers of steel doors include the following:

AMWELD Building Products Div.
Ceco Corp.
Curries
Fenestra
Republic Builders Products Corp.
Steelcraft Mfg. Co.

Thermal-Rated (Insulating) Assemblies: At all exterior locations, provide doors which have been fabricated as thermal insulating door and frame assemblies and tested in accordance with ASTM C 236 or ASTM C 976. Unless otherwise indicated, provide assemblies with maximum apparent U factor for thermal-rated assemblies is 0.24 Btu/hr (ft^2) degrees F.

ADJUSTABLE LOUVERS:

Material: Factory finish to match wall panels.

Free Airflow: Minimum 5 percent.

Weather Projection: 60 percent or more.

Insect Screen: Manufacturer's standard 14- to 18-mesh.

FINISH:

Colors: Colors shall be as selected by the Contractor.

Fluoropolymer Finish: Provide factory-applied fluoropolymer finish to exterior galvanized steel siding and interior liner wall and related trim and accessories.

PIPE PENETRATIONS:

For pipe penetrations through the roof use a "DEKTITE" pipe flashing unit as manufactured by ITW Buildex, or approved equal. Provide a stainless steel hose clamp for positive sealing of flashing to pipe.

PART 3--EXECUTION

ERECTION:

Framing: Erect structural framing true to line, level and plumb, rigid and secure. Level base plates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use a non-shrinking grout to obtain uniform bearing and to maintain a level base line elevation. Moist cure grout for not less than 7 days after placement.

Bracing:

Install diagonal rod or angle bracing in roof as required.

Diagonal/rod bracing shall not interfere with ceiling purlins.

Install portal frame bracing in sidewalls as specified.

Framed Openings: Provide shapes of proper design and size to reinforce opening and to carry loads and vibrations imposed, including equipment furnished under mechanical or electrical work. Securely attach to building structural frame.

ROOFING AND SIDING:

General:

Install panels and associated items for neat and weather tight enclosure. Avoid "panel creep" or application not true to line. Protect factory finish from damage.

Provide weather seal under ridge cap. Flash and seal roof panels at eave, swaged joints and rake with manufacturer's standard rubber, neoprene, or other closures to exclude weather.

Roof Sheets:

Provide sealant tape at lapped joints of ribbed or fluted roof sheets, and between roof sheeting and accessories.

Apply sealant tape continuous to clean, dry surface of weather side of fastenings on end laps and on sidelaps of corrugated or nesting type, ribbed or fluted panels and elsewhere to make weatherproof to driving rains.

Wall Sheets:

Apply elastomeric sealant continuous between metal base channel (sill angle) and concrete foundation and elsewhere as necessary for waterproofing. Handle and apply sealant and backup in accordance with sealant manufacturer's recommendations.

Align bottoms of wall panels. Fasten flashings, trim around openings, etc., with self-tapping screws.

Sheet Metal Accessories: Install louvers and other sheet metal accessories in accordance with manufacturer's recommendations for positive anchorage to building and weathertight mounting.

Interior Wall Liner Panels: Install all wall liner panels as shown on the drawings.

Certification: The Subcontractor shall submit a certified statement that all standing seam metal roofing, flashings, rain gutter and downspout, wall panels, structural framing, and anchor bolts have been installed in strict accordance with the manufacturer's printed instructions and this specification.

Door Installation: Fit hollow metal doors accurately in frames, within clearance specified in SDI-100.

HARDWARE SCHEDULE:

Group No. 2:

Butts:	1-1/2 pair Mckinney T4A3386 4.5 x 4.5 x BHMA 630.
Lockset:	1 Best 84-7-C-15D-S3 x BHMA 626.
Closer:	1 LCN P4041 x BHMA 673.
Weatherstripping:	1 set Pemko 319CN x S88 x BHMA 628.
Door Bottom:	1 Pemko 430CRL x BHMA 628.
Threshold:	1 Pemko 254X4AFG x BHMA 628.

FIELD QUALITY CONTROL:

Manufacturer's Services: Provide a minimum of 1 day of manufacturer's representative at site for installation assistance, inspection, and certification of installation.

END OF SECTION 13122

SECTION 13401--PROCESS INSTRUMENTATION AND CONTROL SYSTEMS (PICS)

PART 1--GENERAL

REFERENCES:

The following is a list of standards which may be referenced in this section:

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A182	Standard Specification for Forged or Rolled Alloy-Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service
ASTM A276	Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes
ASTM A312	Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes
ASTM B32	Standard Specification for Solder Metal
ASTM B88	Standard Specification for Seamless Copper Water Tube

INSTRUMENT SOCIETY OF AMERICA (ISA)

ISA S5.1	Instrumentation Symbols and Identification (NRC ADOPTED)
ISA S50.1	Compatibility of Analog Signals for Electronic Industrial Process Instruments

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	Enclosures for Electrical Equipment (1,000 Volts Maximum)
NEMA ICS 1	General Standards for Industrial Control and Systems

SUMMARY:

Work Includes:

The subcontractor shall furnish and install all material and labor to accomplish the design as depicted by the Construction Documents. The Contractor shall provide all material and hardware necessary to achieve the required function whether it is called for or not. This also includes, but is not limited to, all testing, all calibration, all adjustment, all startup, all training, and all documentation pertaining to the PICS system.

Major components and controls to integrate into PICS and program include:

Landfill Crest Pad Building Control Panel, PLC, and Operator Interface.

Evaporator Pond(s) Crest Building Control Panel, PLC, and Operator Interface.

Landfill Leachate Collection and Detection and Recovery System Pump Control.

Landfill Leachate Collection and Detection and Recovery System Pump Discharge Flow and Flow Totalization.

Landfill Leachate Collection and Recovery System Continuous Level Measurement.

Landfill Leak Detection and Recovery System Continuous Level Measurement.

Evaporator Pond(s) Leak Detection and Recovery System Continuous Level Measurement.

Carrier Pipe and Manhole Leak Detection Chamber Discrete Level Measurement.

Landfill Crest Pad Building Sump Discrete Level Measurement.

Evaporator Pond(s) Crest Pad Building Sump Discrete Level Measurement.

Interlock Control between Crest Pad Building Sump and Leachate Collection and Leak Detection and Recovery System Pump Controls

Landfill Crest Pad Building Continuous Temperature Measurement.

Evaporation Pond(s) Crest Pad Building Continuous Temperature Measurement.

Landfill Crest Pad Building Discrete Power Measurement.

Evaporation Pond(s) Crest Pad Building Discrete Power Measurement.

Landfill Crest Pad Building Discrete Smoke Detection.

Evaporation Pond(s) Crest Pad Building Discrete Smoke Detection.

DEFINITIONS:

Abbreviations:

LCP: Local Control Panel.

MCC: Motor Control Center.

OIU: Operator Interface Unit.

PAT: Performance Acceptance Test.

PLC: Programmable Logic Controller.

SLC: Small Programmable Logic Controller.

Rising/Falling: Terms used to define actions of discrete devices about their set points.

Rising: Contacts change state when an increasing process variable rises through set point.

Falling: Contacts change state when a decreasing process variable falls through set point.

Signal Types:

Analog Signals, Current Type:

4 to 20 mA dc signals conforming to ISA S50.1.

Unless otherwise indicated for specific PICS Subsystem components, use the following ISA 50.1 options:

Transmitter Type: Number 2, two-wire.

Transmitter Load Resistance Capacity: Class L.

Fully isolated transmitters and receivers.

Analog Signals, Voltage Type: 1 to 5 volts dc within control panels only.

Discrete signals, two-state logic signals using dc or 120V ac sources as indicated.

Special Signals: Other types of signals used to transmit analog and digital information between field elements, transmitters, receivers, controllers, and digital devices.

Instrument Tag Numbers: In accordance with DOE-ID Architectural Standards.

DELIVERY, STORAGE, AND HANDLING:

Provide site and warehouse storage facilities for PICS equipment.

Prior to shipment, include corrosive-inhibitive vapor capsules in shipping containers, and related equipment as recommended by the capsule manufacturer.

Prior to installation, store items in dry indoor locations. Provide heating in storage areas for items subject to corrosion under damp conditions.

Cover panels and other elements that are exposed to dusty construction environments.

ENVIRONMENTAL REQUIREMENTS:

Standard Environmental Requirements: Unless otherwise noted, provide equipment for continuous operation in these environments:

Freestanding Panel and Consoles:

Inside: NEMA 12.

Smaller Panels and Assemblies (that are not Freestanding):

Inside: NEMA 12.

All Other Locations: NEMA 4X.

Field Elements: Outside.

Special Environmental Requirements: Design panels for continuous operation in environments listed:

Building Sump Power Local Control Panel LCP-CD-940 to be installed inside the INEEL CERCLA Landfill Crest Pad Building.

Building Sump Control Local Control Panel LCP-CD-941 to be installed inside the INEEL CERCLA Landfill Crest Pad Building.

Building Sump Local Control Panel LCP-CD-942 to be installed inside the INEEL CERCLA Evaporation Ponds Crest Pad Building.

Combined Sump Local Control Panel LCP-CD-943 to be installed inside the INEEL CERCLA Evaporation Ponds Crest Pad Building.

Control Panel CP-CD-950 to be installed inside the INEEL CERCLA Landfill Crest Pad Building.

Control Panel CP-CD-951 to be installed inside the INEEL CERCLA Evaporation Ponds Crest Pad Building.

Environmental Design Requirements: Environmental conditions are defined below:

Inside:

Temperature: 10 to 30 degrees C.

Relative Humidity: 15 to 90 percent noncondensing.

NEC Classification: Nonhazardous.

Outside:

Temperature: Minus 40 to 40 degrees C.

Relative Humidity: 15 to 90 percent noncondensing.

NEC Classification: Nonhazardous.

Snow Accumulation: 48 inches.

PART 2--PRODUCTS

GENERAL:

The general functions of the PICS are as depicted on the Drawings. The PICS contractor shall provide a full-featured system that is complete, calibrated, and fully operational.

Like Equipment Items:

Use products of one manufacturer and of the same series or family of models to achieve standardization for appearance, operation, maintenance, spare parts, and manufacturer's services.

Implement all same or similar functions in same or similar manner. For example, control logic, sequence controls, and display layouts.

I&C COMPONENTS:

Components for Each Loop: Major components for each loop are listed in Instrument List referenced in Article SUPPLEMENTS. Furnish all equipment that is necessary to achieve required loop performance.

Component Specifications: Generalized specifications for each type of component are located in Article SUPPLEMENTS.

NAMEPLATES AND TAGS:

Panel Nameplates: Enclosure identification located on the enclosure face.

Location and Inscription: As shown.

Materials: Laminated plastic attached to panel with stainless steel screws.

Letters: 1/2-inch white on black background, unless otherwise noted.

Component Nameplates—Panel Face: Component identification located on panel face under or near component.

Location and Inscription: As shown.

Materials: Laminated plastic attached to panel with stainless steel screws.

Letters: 3/16-inch white on black background, unless otherwise noted.

Component Nameplates—Back of Panel: Component identification located near component inside of enclosure.

Inscription: Component tag number.

Materials: Adhesive backed, laminated plastic.

Letters: 3/16-inch white on black background, unless otherwise noted.

Legend Plates for Panel Mounted Pushbuttons, Lights, and Switches:

Inscription: Refer to:

Table under paragraph Standard Pushbutton Colors and Inscriptions.

Table under paragraph Standard Light Colors and Inscriptions.

P&IDs in Drawings.

Materials: Engraved plastic, keyed legend plates. Secured to panel by mounting nut for pushbutton, light, or switch.

Letters: Black on gray or white background.

Service Legends: Component identification nameplate located on face of component.

Inscription: As shown.

Materials: Adhesive backed, laminated plastic.

Letters: 3/16-inch white on black background, unless otherwise noted.

Nametags: Component identification for field devices.

Inscription: Component tag number.

Materials: 16-gauge, Type 304 stainless steel.

Letters: 3/16-inch imposed.

Mounting: Affix to component with 16- or 18-gauge stainless steel wire or stainless steel screws.

ELECTRICAL REQUIREMENTS:

In accordance with Division 16, ELECTRICAL.

I&C and electrical components, terminals, wires, and enclosures: UL recognized or UL listed.

Wires Within Enclosures:

ac Circuits:

Type: 600-volt, Type SIS stranded copper.

Size: For current to be carried, but not less than No. 14 AWG.

Analog Signal Circuits:

Type: 600-volt stranded copper, twisted shielded pairs.

Size: No. 16 AWG, minimum.

Other dc Circuits:

Type: 600-volt, Type SIS stranded copper.

Size: For current carried, but not less than No. 18 AWG.

Special Signal Circuits: Use manufacturer's standard cables.

Wire Identification: Numbered and tagged at each termination.

Wire Tags: Snap-on or slip-on PVC wire markers with legible machine printed markings and numbers. Adhesive or taped-on tags are not acceptable.

Wires entering or leaving enclosures, terminate and identify as follows:

Analog and discrete signal, terminate at numbered terminal blocks.

Special signals, terminated using manufacturer's standard connectors.

Identify wiring in accordance with Section 16120, CONDUCTORS.

Terminal Blocks for Enclosures:

Wire spare PLC I/O points to terminal blocks.

One wire per terminal for field wires entering enclosures.

Maximum of two wires per terminal for 18-WG wire for internal enclosure wiring.

Spare Terminals: 20 percent of all connected terminals, but not less than 5 per terminal block.

General:

Connection Type: Screw compression clamp.

Compression Clamp:

Complies with DIN-VDE 0611.

Hardened steel clamp with transversal groves that penetrate wire strands providing a vibration-proof connection.

Guides strands of wire into terminal.

Screws: Hardened steel, captive and self-locking.

Current Bar: Copper or treated brass.

Insulation:

Thermoplastic rated for minus 55 to plus 110 degree C.

Two funneled shaped inputs to facilitate wire entry.

Mounting:

Standard DIN rail.

Terminal block can be extracted from an assembly without displacing adjacent blocks.

End Stops: Minimum of one at each end of rail.

Wire Preparation: Stripping only permitted.

Jumpers: Allow jumper installation without loss of space on terminal or rail.

Marking System:

Terminal number shown on both sides of terminal block.

Allow use of preprinted and field marked tags.

Terminal strip numbers shown on end stops.

Mark terminal block and terminal strip numbers as shown on Panel Control Diagrams and Loop Diagrams.

Terminal Block, General-Purpose:

Rated Voltage: 600V ac.

Rated Current: 30 amp.

Wire Size: No. 22 to No. 10 AWG.

Rated Wire Size: No. 10 AWG.

Color: Grey body.

Spacing: 0.25 inch, maximum.

Test Sockets: One screw test socket 0.079-inch diameter.

Manufacturer and Product: Entrelec; Type M4/6.T.

Terminal Block, Ground:

Wire Size: No. 22 to No. 12 AWG.

Rated Wire Size: No. 12 AWG.

Color: Green and yellow body.

Spacing: 0.25 inch, maximum.

Grounding: Ground terminal blocks electrically grounded to the mounting rail.

Manufacturer and Product: Entrelec; Type M4/6.P.

Terminal Block, Blade Disconnect Switch:

Rated Voltage: 600V ac.

Rated Current: 10-amp.

Wire Size: No. 22 to No. 12 AWG.

Rated Wire Size: No. 12 AWG.

Color: Grey body, orange switch.

Spacing: 0.25 inch, maximum.

Manufacturer and Product: Entrelec; Type M4/6.SN.T.

Terminal Block, Fused, 24V dc:

Rated Voltage: 600V dc.

Rated Current: 16-amp.

Wire Size: No. 22 to No. 10 AWG.

Rated Wire Size: No. 10 AWG.

Color: Grey body.

Fuse: 0.25 inch by 1.25 inch.

Indication: LED diode 24V dc.

Spacing: 0.512 inch, maximum.

Manufacturer and Product: Entrelec; Type M10/13T.SFL.

Terminal Block, Fused, 120V ac:

Rated Voltage: 600V ac.

Rated Current: 16-amp.

Wire Size: No. 22 to No. 10 AWG.

Rated Wire Size: No. 10 AWG.

Color: Grey body.

Fuse: 0.25 inch by 1.25 inch.

Indication: Neon Lamp 110V ac.

Leakage Current: 1.8 mA, maximum.

Spacing: 0.512 inch, maximum

Manufacturer and Product: Entrelec; Type M10/13T.SFL.

Terminal Block, Fused, 120V ac, High Current:

Rated Voltage: 600V ac.

Rated Current: 35 amps.

Wire Size: No. 18 to No. 8 AWG.

Rated Wire Size: No. 8 AWG.

Color: Grey.

Fuse: 13/32 inch by 1.5 inch.

Spacing: 0.95 inch, maximum.

Manufacturer and Product: Entrelec; Type MB10/24.SF.

Grounding of Enclosures:

Furnish copper isolated ground bus. Take car to ensure that this bus is connected to the safety ground bus at only one point.

Single Point Ground for Each Analog Loop:

Group and connect shields in following locations:

Control Panel.

Ground terminal block rails to ground bus.

Analog Signal Isolators: Furnish signal isolation for analog signals that are sent from one enclosure to another and where required to provide proper function. Do not wire in series instruments on different panels, cabinets, or enclosures.

Power Distribution Within Panels:

Feeder Circuits:

One or more 120V ac, 60-Hz feeder circuits as shown on Drawings.

Make provisions for feeder circuit conduit entry.

Furnish terminal blocks for termination of wires.

Power Panel: Furnish main circuit breaker and a circuit breaker on each individual branch circuit distributed from power panel.

Locate to provide clear view of and access to breakers when door is open.

Breaker Sizes: Coordinate such that fault in branch circuit will blow only branch breaker but not trip the main breaker.

Branch Circuit Breaker: Select size of circuit breaker to suit load at 250V ac.

Breaker Manufacturers and Products: Allen-Bradley 1492-GH.

Circuit Wiring: P&IDs and Control Diagrams on Drawings show function only. Use following rules for actual circuit wiring:

Devices on Single Circuit: 20, maximum.

Multiple Units Performing Parallel Operations: To prevent failure of any single branch circuit from shutting down entire operation, do not group all units on same branch circuit.

Branch Circuit Loading: 12 amperes continuous, maximum.

Panel Lighting and Service Outlets: Put on separate 15-amp, 120V ac branch circuit.

Provide 120-volt ac plugmold for panel components with line cords.

Signal Distribution:

Within Panels: 4 to 20 mA dc signals may be distributed as 1 to 5V dc.

Outside Panels: Isolated 4 to 20 mA dc only.

All signal wiring in twisted shielded pairs.

Signal Switching:

Use dry circuit type relays or switches.

No interruption of 4 to 20 mA loops during switching.

Switching Transients in Associated Signal Circuit:

4 to 20 mA dc Signals: 0.2 mA, maximum.

1 to 5V dc Signals: 0.05V, maximum.

Relays:

General:

Relay Mounting: Plug-in type socket.

Relay Enclosure: Furnish dust cover.

Socket Type: Screw terminal interface with wiring.

Socket Mounting: Rail.

Provide holddown clips.

Control Circuit Switching Relay, Nonlatching:

Type: Compact general-purpose plug-in.

Contact Arrangement: 3 Form C contacts.

Contact Rating: 10A at 28V dc or 240V ac.

Contact Material: Silver cadmium oxide alloy.

Coil Voltage: As noted or shown.

Coil Power: 1.2 watts (dc), 1.75VA (ac).

Expected Mechanical Life: 10,000,000 operations.

Expected Electrical Life at Rated Load: 100,000 operations.

Indication Type: Neon or LED indicator lamp.

Push to test button.

Manufacturer and Product: Allen-Bradley; 700-HA Series.

For all 11-pin relays use Allen-Bradley 700-HN203. For 8-pin relays, use Allen-Bradley 700-HN203.

Control Circuit Switching Relay, Latching:

Type: Dual coil mechanical latching relay.

Contact Arrangement: 2 Form C contacts.

Contact Rating: 10A at 28V dc or 120V ac.

Contact Material: Silver cadmium oxide alloy.

Coil Voltage: As noted or shown.

Coil Power: 2.7 watts (dc), 5.3VA (ac).

Expected Mechanical Life: 500,000 operations.

Expected Electrical Life at Rated Load: 50,000 operations.

Manufacturer and Product: Potter and Brumfield; Series KB/KBP.

Control Circuit Switching Relay, Time Delay:

Type: Adjustable time delay relay.

Contact Arrangement: 3 Form C contacts.

Contact Rating: 10A at 240V ac.

Contact Material: Silver cadmium oxide alloy.

Coil Voltage: As noted or shown.

Operating Temperature: Minus 10 to 55 degrees C.

Repeatability: Plus or minus 0.5 percent.

Timing Module: Solid state multifunction plug-in module. Plugs into socket to add timing feature to general purpose relay.

Manufacturer and Products: Allen-Bradley 700-HT1 for ac, 700-HT2 for dc.

Power Supplies:

Furnish to power instruments requiring external dc power, including two-wire transmitters and dc relays.

Convert 120V ac, 60-Hz power to dc power of appropriate voltage(s) with plus or minus 0.05 percent voltage regulation and ripple control to assure that instruments being supplied can operate within their required tolerances.

Provide output over voltage and over current protective devices to:

Protect instruments from damage due to power supply failure.

Protect power supply from damage due to external failure.

Enclosures: NEMA 1 in accordance with NEMA 250.

Mount such that dissipated heat does not adversely affect other components.

Fuses: For each dc supply line to each individual two-wire transmitter.

Type: Indicating.

Mount so fuses can be easily seen and replaced.

Resistors: All resistors used to derive a 1-5V dc signal from a 4-20 mA dc signal shall be 250 ohm, ±1 percent, 3 watts, axial lead, non-inductive wire wound, welded construction, silicone coated, 1,000V ac dielectric. Vishay-Dale RS-2B-NS or equal. 250 ohms is a standard value in this line, and use of a resistance other that 250 ohms is not acceptable.

Internal Panel Lights for Freestanding Panels:

Type: Switched 100-watt fluorescent back-of-panel lights.

Quantity: One light for every 4 feet of panel width.

Mounting: Inside and in the top of back-of-panel area.

Protective metal shield for lights.

Service Outlets for Freestanding Panels:

Type: Three-wire, 120-volt, 15-ampere, GFI duplex receptacles.

Quantity:

For Panels 4 Feet Wide and Smaller: One.

For Panels Wider Than 4 Feet: One for every 4 feet of panel width, two minimum per panel.

Mounting: Evenly spaced along back-of-panel area.

Standard Pushbutton Colors and Inscriptions: Use following color code and inscriptions for pushbuttons, unless otherwise noted in Instrument List, Article SUPPLEMENTS.

Tag Function	Inscription(s)	Color
OO	ON	Red
	OFF	Green
OC	OPEN	Red
	CLOSE	Green
OCA	OPEN	Red
	CLOSE	Green
	AUTO	White
OOA	ON	Red
	OFF	Green
	AUTO	White
MA	MANUAL	Yellow
	AUTO	White
SS	START	Red
	STOP	Green
RESET	RESET	Red
EMERGENCY STOP	EMERGENCY STOP	Red

Unused or Noninscribed Buttons: Black.

Standard Light Colors and Inscriptions: The following table gives the inscriptions for service legends, and the lens colors for indicating lights.

Tag Function	Inscription(s)	Color
ON	ON	Red
OFF	OFF	Green
OPEN	OPEN	Red
CLOSED	CLOSED	Green
LOW	LOW	Green
FAIL	FAIL	Amber
HIGH	HIGH	Red
AUTO	AUTO	White
MANUAL	MANUAL	Yellow
LOCAL	LOCAL	White
REMOTE	REMOTE	Yellow

Lettering Color:

Black on white and amber lenses.

White on red and green lenses.

FABRICATION:

General:

Panels with external dimensions and instruments arrangement as shown on Drawings.

Panel Construction and Interior Wiring: In accordance with the National Electrical Code, state and local codes, NEMA, ANSI, UL, and ICECA.

Fabricate panels, install instruments, wire, and plumb, at the PICS factory.

Electrical Work: In accordance with Division 16, ELECTRICAL.

Shop Assembly: No panel assembly other than correction of minor defects or minor transit damage shall be done on panels at site.

UL Label for Enclosures: UL label stating "Listed Enclosed Industrial Control Panel."

Wiring Within PICS Panels:

Routed through slotted PVC wiring duct with mating cover.

Hinge Wiring: Secure at each end so that bending or twisting will be around longitudinal axis of wire. Protect bend area with sleeve.

Arrange wiring neatly, cut to proper length, and remove surplus wire.

Abrasion protection for wire bundles which pass through holes or across edges of sheet metal.

Connections to Screw Type Terminals:

Locking-fork-tongue or ring-tongue lugs.

Use manufacturer's recommended tool with required sized anvil to make crimp lug terminations and to avoid crossovers at a 90 degree angle.

Wires terminated in a crimp lug, maximum of one.

Lugs installed on a screw terminal, maximum of two.

Connections to Compression Clamp Type Terminals:

Strip, prepare, and install wires in accordance with terminal manufacturer's recommendations.

Wires installed in a compression screw and clamp, maximum of one for field wires entering enclosure, otherwise maximum of two, or quantity as approved by manufacturer.

Splicing and tapping of wires, allowed only at device terminals or terminal blocks.

Terminate 24V dc and analog terminal blocks separate from 120V ac circuit terminal blocks.

Separate analog and dc circuits by at least 6 inches from ac power and control wiring, except at unavoidable crossover points and at device terminations.

Arrange wiring to allow access for testing, removal, and maintenance of circuits and components.

Plastic Wire Ducts Fill: Do not exceed manufacturer's recommendation.

Temperature Control:

Freestanding Panels:

Nonventilated Panels: Size to adequately dissipate heat from equipment mounted inside panel or on panel.

Ventilated Panels:

Provide all ventilated panels with louvers and fans with filters or other cooling means as required to maintain internal temperature between 40 degrees F to 90 degrees F.

For panels with backs against wall, furnish louvers on top and bottom of panel sides.

For panels without backs against wall, furnish louvers on top and bottom of panel back.

Louver Construction: Stamped sheet metal.

Ventilation Fans:

Furnish where required to provide adequate cooling.

Create positive internal pressure within panel.

Fan Motor Power: 120 volt, 60-Hz ac, thermostatically controlled.

Air Filters: Washable aluminum, Hoffman Series A-FLT.

Refrigerated System: Furnish where heat dissipation cannot be adequately accomplished with natural convection or forced ventilation. Smaller Panels (that are not freestanding): Size to adequately dissipate heat from equipment mounted inside panel or in panel face.

Freestanding Panel Construction:

Materials: Sheet steel, unless otherwise shown on Drawings with minimum thickness of 12-gauge, unless otherwise noted.

Panel Fronts:

Fabricated from a single piece of sheet steel, unless otherwise shown on Drawings.

No seams or bolt heads visible when viewed from front.

Panel Cutouts: Smoothly finished with rounded edges.

Stiffeners: Steel angle or plate stiffeners or both on back of panel face to prevent panel deflection under instrument loading or operation.

Internal Framework:

Structural steel for instrument support and panel bracing.

Permit panel lifting without racking or distortion.

Lifting rings to allow simple, safe rigging and lifting of panel during installation.

Adjacent Panels: Securely bolted together so front faces are parallel.

Doors: Full height, fully gasketed access doors where shown on Drawings.

Latches: Three-point, Southco Type 44.

Handles: "D" ring, foldable type.

Hinges: Full length, continuous, piano type, steel hinges with stainless steel pins.

Rear Access Doors: Extend no further than 24 inches beyond panel when opened to 90-degree position.

Front and Side Access Doors: As shown on Drawings.

Nonfreestanding Panel Construction:

Based on environmental design requirements required and referenced in Article ENVIRONMENTAL REQUIREMENTS, provide the following:

For panels listed as inside:

Enclosure Type: NEMA 12 in accordance with NEMA 250.

Materials: Steel.

For all other panels:

Enclosure Type: NEMA 4X in accordance with NEMA 250.

Materials: Type 316 stainless steel.

Metal Thickness: 14-gauge, minimum.

Doors:

Rubber-gasketed with continuous hinge.

Stainless steel lockable quick-release clamps.

Manufacturers:

Hoffman Engineering Co.

H. F. Cox.

Factory Finishing:

Enclosures:

Stainless Steel and Aluminum: Not painted.

Nonmetallic Panels: Not painted.

Steel Panels:

Sand panel and remove mill scale, rust, grease, and oil.

Fill imperfections and sand smooth.

Prepare metal and paint panel interior and exterior with one coat of epoxy coating metal primer, two finish coats of two-component type epoxy enamel.

Sand surfaces lightly between coats.

Dry Film Thickness: 3 mils, minimum.

Color: Light gray.

Manufacturer's standard finish color, except where specific color is indicated. If manufacturer has no standard color, finish equipment with light gray color.

CORROSION PROTECTION:

Corrosion-Inhibiting Vapor Capsule Manufacturers:

Northern Instruments; Model Zerust VC.

Hoffmann Engineering Co; Model A-HCI.

PART 3--EXECUTION

EXAMINATION:

For equipment not provided by PICS, but that directly interfaces with the PICS, verify the following conditions:

Proper installation.

Calibration and adjustment of positioners and I/P transducers.

Correct control action.

Switch settings and dead bands.

Opening and closing speeds and travel stops.

Input and output signals.

Report discrepancies to the Construction Manager and the contractor furnishing the material.

INSTALLATION:

Material and Equipment Installation: Retain a copy of manufacturers' instructions at site, available for review at all times.

Electrical Wiring: As specified in Division 16, ELECTRICAL

Removal or Relocation of Materials and Equipment:

Remove from site materials that were part of the existing facility but are no longer used, unless otherwise directed by Construction Subcontractor to deliver to Contractor.

Repair affected surfaces to conform to type, quality, and finish of surrounding surface.

TRAINING:

General:

Provide an integrated training program to meet specific needs of Contractor's personnel.

Include training sessions, classroom and field, for managers, engineers, operators, and maintenance personnel.

Provide instruction on two working shifts as needed to accommodate the Contractor's personnel schedule.

Contractor reserves the right to make and reuse video tapes of training sessions.

Provide reference handouts that cover the course content for all personnel attending any course or training session.

Operations and Maintenance Training:

Include a review of O&M manuals and survey of spares, expendables, and test equipment.

Use equipment similar to that provided or currently owned by Contractor.

Provide training suitable for instrument technicians with at least a 2-year associate engineering or technical degree, or equivalent education and experience in electronics or instrumentation.

Operations Training:

Training Session Duration: One 8-hour instructor days.

Number of Training Sessions: Two.

Location: Site.

Content: Conduct training on loop-by-loop basis.

Loop Functions: Understanding of loop functions, including interlocks for each loop.

Loop Operation: For example, adjusting process variable set points, AUTO/MANUAL control transfer, AUTO and MANUAL control, annunciator acknowledgement and resetting.

Interfaces with other control systems.

Maintenance Training:

Training Session Duration: One 8-hour instructor days.

Number of Training Sessions: One.

Location: Project site.

Content: Provide training for each type of component and function provided.

Loop Functions: Understanding details of each loop and how they function.

Component calibration.

Adjustments: For example, controller tuning constants, current switch trip points, and similar items.

Troubleshooting and diagnosis for components.

Replacing lamps, fuses.

Component removal and replacement.

Periodic maintenance.

CLEANING/ADJUSTING:

Repair affected surfaces to conform to type, quality, and finish of surrounding surface.

Cleaning:

Prior to closing system using tubing, clear tubing of interior moisture and debris.

Upon completion of Work, remove materials, scraps, and debris from interior and exterior of equipment.

PROTECTION:

Protect enclosures and other equipment containing electrical, instrumentation and control devices, including spare parts, from corrosion through the use of corrosion-inhibiting vapor capsules.

Periodically replace capsules in accordance with capsule manufacturer's recommendations. Replace capsules just prior to Final Payment and Acceptance.

SUPPLEMENTS:

Supplements listed below, following "END OF SECTION," are part of this Specification.

Supplement 1—Instrument List.

Supplement 2—PLC Input and Output List.

Supplement 3—Instrument Calibration Sheet: Provides detailed information on each instrument (except simple hand switches, lights, and similar items). To be filled out under this section.

Supplement 4—I&C Valve Adjustment Sheet: Each sheet shows detailed information for installation, adjustment, and calibration of a given valve. To be filled out under this section.

Supplement 5—Performance Acceptance Test Sheet: Describes the PAT for a given loop. The format is mostly free form.

Lists the requirements of the loop.

Briefly describes the test.

Cites expected results.

Provides space for check off by witness.

END OF SECTION 13401

INSTRUMENT LIST

Item	Rev	Tag 1	Tag2	Tag3	Description	Description	P&ID	Manufacturer	Model Number	Additional Information	Options	Comments
		ISA	Process	Loop								
1	0	FT	CD	203-1	Landfill Leachate Collection and Recovery System High Flow Pump	Flow Propeller Transmitter	IN-201	Provided by leachate collection pump vendor				
2	0	FI	CD	203-1	Landfill Leachate Collection and Recovery System High Flow Pump	Flow Indicator	IN-201	Action Instruments	Model V508	7-segment, 3-1/2 digit panel mounted LED signal indicator		120Vac power
3	0	FT	CD	203-2	Landfill Leachate Collection and Recovery System Low Flow Pump	Flow Propeller Transmitter	IN-201	Provided by leachate collection pump vendor				
4	0	FI	CD	203-2	Landfill Leachate Collection and Recovery System Low Flow Pump	Flow Indicator	IN-201	Action Instruments	Model V508	7-segment, 3-1/2 digit panel mounted LED signal indicator		120Vac power
5	0	FT	CD	204	Landfill Leak Detection and Recovery System Pump	Flow Propeller Transmitter	IN-201	Provided by leachate collection pump vendor				
6	0	FI	CD	204	Landfill Leak Detection and Recovery System Pump	Flow Indicator	IN-201	Action Instruments	Model V508	7-segment, 3-1/2 digit panel mounted LED signal indicator		120Vac power
7	0	FT	CD	208	Landfill Secondary Leak Detection and Recovery System Pump	Flow Propeller Transmitter	IN-201	Provided by leachate collection pump vendor				
8	0	FI	CD	208	Landfill Secondary Leak Detection and Recovery System Pump	Flow Indicator	IN-201	Action Instruments	Model V508	7-segment, 3-1/2 digit panel mounted LED signal indicator		120Vac power
9	0	LT	CD	103	Landfill Leachate Collection and Recovery System	Submersible Pressure Transducer	IN-201	Provided by leachate collection pump vendor				
10	0	LI	CD	103	Landfill Leachate Collection and Recovery System	Level Indicator	IN-201	Action Instruments	Model V508	7-segment, 3-1/2 digit panel mounted LED signal indicator		120Vac power
11	0	LT	CD	104	Landfill Leak Detection and Recovery System	Submersible Pressure Transducer	IN-201	Provided by leachate collection pump vendor				
12	0	LI	CD	104	Landfill Leak Detection and Recovery System	Level Indicator	IN-201	Action Instruments	Model V508	7-segment, 3-1/2 digit panel mounted LED signal indicator		120Vac power
13	0	LT	CD	108	Landfill Secondary Leak Detection and Recovery System	Submersible Pressure Transducer	IN-201	Provided by leachate collection pump vendor				
14	0	LI	CD	108	Landfill Secondary Leak Detection and Recovery System	Level Indicator	IN-201	Action Instruments	Model V508	7-segment, 3-1/2 digit panel mounted LED signal indicator		120Vac power
15	0	TT	CD	1799	Landfill Crest Pad Building	Temperature Transmitter	IN-201	Rosemount	Model 3144-D-1-NA-X1	Series 68 RTD with spring loaded thermowell		Pipe Mount
16	0	-	-	-	Spare	Spare	IN-201	Action Instruments	Model V508	7-segment, 3-1/2 digit panel mounted LED signal indicator		120Vac power
17	0	LSH	CD	105	Landfill Crest Pad Building Sump High	Level Float	IN-201	Gems Sensors	LS-700 Series Buna N 39049	Type 1 Mounting Stem		Group 1 Wiring
18	0	LSHH	CD	105	Landfill Crest Pad Building Sump High High	Level Float	IN-201	Gems Sensors	LS-700 Series Buna N 39049	Type 1 Mounting Stem		Group 1 Wiring
77	0	LSL	CD	105	Landfill Crest Pad Building Sump Low	Level Float	IN-201	Gems Sensors	LS-700 Series Buna N 39049	Type 1 Mounting Stem		Group 1 Wiring
19	0	LCP	CD	941	Landfill Crest Pad Building Sump Panel	Enclosure	IN-201	Hoffman	A-161206LP	Type 12 Wall Mount		Provide devices as shown
20	0	JSH	CD	1799	Landfill Crest Pad Building	Power Relay	IN-201	Allen Bradley				
21	0	ZS	CD	1799	Landfill Crest Pad Building	Door Intrusion Switch	IN-201	Square-D	Class 9007 Type C54B2	Level Arm MA-11		10 Degree Movement
22	0	YL	CD	1799	Landfill Crest Pad Building	Alarm Light	IN-201	Edwards	Adaptabeacon 52R-N5-40W			Rotating Lens outdoor pipe mount
23	0	LT	CD	102	Evaporation East Pond Leak Detection and Recovery System	Submersible Pressure Transducer	IN-202	Provided by leachate collection pump vendor				
24	0	LI	CD	102	Evaporation East Pond Leak Detection and Recovery System	Level Indicator	IN-202	Action Instruments	Model V508	7-segment, 3-1/2 digit panel mounted LED signal indicator		120Vac power
25	0	LT	CD	101	Evaporation West Pond Leak Detection and Recovery System	Submersible Pressure Transducer	IN-202	Provided by leachate collection pump vendor				
26	0	LI	CD	101	Evaporation West Pond Leak Detection and Recovery System	Level Indicator	IN-202	Action Instruments	Model V508	7-segment, 3-1/2 digit panel mounted LED signal indicator		120Vac power
27	0	FT	CD	207	Evaporation Pond Combined Sump	Flow Propeller Transmitter	IN-202	Provided by leachate collection pump vendor				
28	0	FI	CD	207	Evaporation Pond Combined Sump	Flow Indicator	IN-202	Action Instruments	Model V508	7-segment, 3-1/2 digit panel mounted LED signal indicator		120Vac power
29	0	FT	CD	327	Evaporation Pond Truck Loading/Unloading	Flow Propeller Transmitter	IN-202	Provided by leachate collection pump vendor				
30	0	FI	CD	327	Evaporation Pond Truck Loading/Unloading	Flow Indicator	IN-202	Action Instruments	Model V508	7-segment, 3-1/2 digit panel mounted LED signal indicator		120Vac power
31	0	FT	CD	330	Evaporation Pond Wastewater from SSSTF	Flow Propeller Transmitter	IN-202	Provided by leachate collection pump vendor				
32	0	FI	CD	330	Evaporation Pond Wastewater from SSSTF	Flow Indicator	IN-202	Action Instruments	Model V508	7-segment, 3-1/2 digit panel mounted LED signal indicator		120Vac power
33	0	TT	CD	1798	Evaporation Pond(s) Crest Pad Building	Temperature Transmitter	IN-202	Rosemount	Model 3144-D-1-NA-X1	Series 68 RTD with spring loaded thermowell		Pipe Mount

INSTRUMENT LIST

Item	Rev	Tag 1	Tag2	Tag3	Description	Description	P&ID	Manufacturer	Model Number	Additional Information	Options	Comments
		ISA	Process	Loop								
34	0	-	-	-	Spare	Spare	IN-201	Action Instruments	Model V508	7-segment, 3-1/2 digit panel mounted LED signal indicator		120Vac power
35	0	LSH	CD	106	Evaporation Pond(s) Crest Pad Building Sump High	Level Float	IN-202	Gems Sensors	LS-700 Series Buna N 39049	Type 1 Mounting Stem		Group 1 Wiring
36	0	LSHH	CD	106	Evaporation Pond(s) Crest Pad Building Sump High High	Level Float	IN-202	Gems Sensors	LS-700 Series Buna N 39049	Type 1 Mounting Stem		Group 1 Wiring
37	0	LCP	CD	942	Evaporation Pond(s) Crest Pad Building Sump Panel	Enclosure	IN-202	Hoffman	A-161206LP	Type 12 Wall Mount		Provide devices as shown
38	0	JSH	CD	1798	Evaporation Pond(s) Crest Pad Building	Power Relay	IN-202					
39	0	LSH	CD	499	Landfill Leachate Transmission Line Leak Detection	Level Float	IN-202	Gems Sensors	LS-700 Series Buna N 39049	Type 1 Mounting Stem		Group 1 Wiring
40	0	ZS	CD	1798	Evaporation Pond(s) Crest Pad Building	Door Intrusion Switch	IN-202	Square-D	Class 9007 Type C54B2	Level Arm MA-11		10 Degree Movement
41	0	YL	CD	1798	Evaporation Pond(s) Crest Pad Building	Alarm Light	IN-201	Edwards	Adaptabeacon 52R-N5-40W			Rotating Lens outdoor pipe mount
42	0	LSH	CD	107	Evaporation Pond(s) Combined Sump High	Level Float	IN-202	Gems Sensors	LS-700 Series Buna N 39049	Type 1 Mounting Stem		Group 1 Wiring
43	0	LSHH	CD	107	Evaporation Pond(s) Combined Sump High High	Level Float	IN-202	Gems Sensors	LS-700 Series Buna N 39049	Type 1 Mounting Stem		Group 1 Wiring
44	0	LSL	CD	107-1	Evaporation Pond(s) Combined Sump Low	Level Float	IN-202	Gems Sensors	LS-700 Series Buna N 39049	Type 1 Mounting Stem		Group 1 Wiring
"	0	LSL	CD	107-2	Evaporation Pond(s) Combined Sump Low	Level Float	IN-202	Gems Sensors	LS-700 Series Buna N 39049	Type 1 Mounting Stem		Group 1 Wiring
45	0	LCP	CD	943	Evaporation Pond(s) Combined Sump Instrinsic Safety Control Panel	Enclosure	IN-202	Hoffman	A-161206LP	Type 12 Wall Mount		Provide devices as shown
"	0	LCP	CD	943	Evaporation Pond(s) Combined Sump Instrinsic Safety Control Panel	4-Channel Internal Intrinsic Safety Barrier	IN-202	Ronan	X57	4-channel assembly with dion Rail Mounting		24VDC Power
46	0				Landfill, SSSTF, and Evaporation Ponds(s) Crest Pad Building Control Panel(s)	Unninterruptible Power Supply	IN-204	Best	Fortress 1.15 kVA	FE1.15KDDBABCA		120V/120V with 30 minutes full load backup
47	0				Landfill, SSSTF, and Evaporation Ponds(s) Crest Pad Building Control Panel(s)	Surge Protection	IN-204	Sola	Sola Surge STV25K	Din Rail Mount		120V/120V surge protection
48	0	OWS	CD	961/962/963	Landfill, SSSTF, and Evaporation Ponds(s) Crest Pad Building Control Panel(s)	Operator Interface Unit	IN-203	Rockwell	Panel View 600	Ethernet OIU		Runtime and Development software
49	0	PLC	CD	961/962/963	Landfill, SSSTF, and Evaporation Ponds(s) Crest Pad Building Control Panel(s)	SLC, I/O, Power Supply and Chassis	IN-204	Allen Bradley	SLC 500 Family	Ethernet Processor		See Control Block Drawing
50	0				Landfill, SSSTF, and Evaporation Ponds(s) Crest Pad Building Control Panel(s)	SLC Programming and Communication Software	IN-204	Rockwell Software	RSLOGIX500	RSLINX LITE		
51	0			961/962/963	Landfill, SSSTF, and Evaporation Ponds(s) Crest Pad Building Control Panel(s)	Ethernet Switch and Accessories	IN-204	Black Box	LE1401A, LE1419C, LE1425C	10/100 BASE T Fiber to Copper		RJ 45 cables and SC connectors
52	0	CP	CD	950	Landfill Crest Pad Building Control Panel	Enclosure	IN-204	Hoffman	A-724818FSD	Free Standing Nema 12 with double doors		Provide safety lockouts
53	0	CP	CD	951	Evaporation Ponds(s) Crest Pad Building Control Panel	Enclosure	IN-204	Hoffman	A-724818FSD	Free Standing Nema 12 with double doors		Provide safety lockouts
54	0				Landfill, SSSTF, and Evaporation Ponds(s) Crest Pad Building Control Panel(s)	24 V dc Power Supplies	IN-204	IDEC	Model PS5RE24	100 Watts		
55	0				Landfill, SSSTF, and Evaporation Ponds(s) Crest Pad Building Control Panel(s)	Cooling Fan	IN-204	Hoffman	A-PA6AXFN			Size accordingly
56	0				Landfill, SSSTF, and Evaporation Ponds(s) Crest Pad Building Control Panel(s)	Temperature Thermostat	IN-204	Hoffman	A-TEMNO			
57	0				Landfill, SSSTF, and Evaporation Ponds(s) Crest Pad Building Control Panel(s)	Main and Sub Breakers	IN-204	Allen Bradley	Bulletin 1492-CB	20AMP		Size accordingly
58	0				Landfill, SSSTF, and Evaporation Ponds(s) Crest Pad Building Control Panel(s)	High Density Breakers	IN-204	Allen Bradley	Bulletin 1492-GH			Size accordingly
59	0				Landfill, SSSTF, and Evaporation Ponds(s) Crest Pad Building Control Panel(s)	Programming Receptacle	IN-204	Hubbell	NEMA 5R-15	15 AMP		
60	0				Landfill, SSSTF, and Evaporation Ponds(s) Crest Pad Building Control Panel(s)	Incandescent Lighting	IN-204	Hoffman	ALTDB1	60 WATT T-10		
61	0				Landfill, SSSTF, and Evaporation Ponds(s) Crest Pad Building Control Panel(s)	Wiring Duct	IN-204	Hoffman	A-250250WH	Provide Cover		Size accordingly
62	0				Landfill, SSSTF, and Evaporation Ponds(s) Crest Pad Building Control Panel(s)	Wiring Duct	IN-204	Hoffman	A-300300WH	Provide Cover		Size accordingly
63	0	-	-	-	Spare	Spare						
64	0			961/962/963	Landfill, SSSTF, and Evaporation Ponds(s) Crest Pad Building Control Panel(s)	Fiber Patch Panel	IN-203	Provided under other contract				
65	0	CP	CD	952	SSSTF(s) Crest Pad Building Control Panel	Enclosure	IN-204	Hoffman	A-724818FSD	Free Standing Nema 12 with double doors		Provide safety lockouts

INSTRUMENT LIST

Item	Rev	Tag 1	Tag2	Tag3	Description	Description	P&ID	Manufacturer	Model Number	Additional Information	Options	Comments
		ISA	Process	Loop								
66	0	FT	CD	201	Evaporation West Pond Leak Detection and Recovery System	Flow Propeller Transmitter	IN-202	Provided by leachate collection pump vendor				
67	0	FI	CD	201	Evaporation West Pond Leak Detection and Recovery System	Flow Indicator	IN-202	Action Instruments	Model V508	7-segment, 3-1/2 digit panel mounted LED signal indicator		120Vac power
68	0	FT	CD	202	Evaporation East Pond Leak Detection and Recovery System	Flow Propeller Transmitter	IN-202	Provided by leachate collection pump vendor				
69	0	FI	CD	202	Evaporation East Pond Leak Detection and Recovery System	Flow Indicator	IN-202	Action Instruments	Model V508	7-segment, 3-1/2 digit panel mounted LED signal indicator		120Vac power
70	0	FT	CD	210	Raw Water	Flow Propeller Transmitter	IN-202	Provided by leachate collection pump vendor				
71	0	FI	CD	210	Raw Water	Flow Indicator	IN-202	Action Instruments	Model V508	7-segment, 3-1/2 digit panel mounted LED signal indicator		120Vac power
72	0			961/962/963	Landfill, SSSTF, and Evaporation Ponds(s) Crest Pad Building Control Panel(s)	Switch Receptacle	IN-204	Hubbell	NEMA 5R-15	15 AMP		
73	0	FT	CD	211	Evaporator Pond Truck Loading	Flow Propeller Transmitter	IN-202	Provided by leachate collection pump vendor				
74	0	FI	CD	211	Evaporator Pond Truck Loading	Flow Indicator	IN-202	Action Instruments	Model V508	7-segment, 3-1/2 digit panel mounted LED signal indicator		120Vac power
75	0	LSH	CD	109	SSSTF Line Leak Detection	Level Float	IN-202	Gems Sensors	LS-700 Series Buna N 39049	Type 1 Mounting Stem		Group 1 Wiring
76	0			961/962/963	Landfill, SSSTF, and Evaporation Ponds(s) Crest Pad Building Control Panel(s) OUI Programming Software	Operator Interface Unit Programming Software	IN-203	Rockwell	PanelBuilder32	Runtime and Development software for the Programming of the OUI(s)		Runtime and Development software

PLC Input and Output List

Item	Rev	Tag 1 ISA	Tag2 Process	Tag3 Loop	Description	P&ID	Engineering Units	Range	Voltage/Current	Address	Typical Wiring Diagram	Notes
1	0	FT	CD	203-1	Landfill Leachate Collection and Recovery System High Flow Pump Flow	IN-201	GPM	0-149	4-20mA	I:01/00	No. 1	
2	0	FT	CD	203-2	Landfill Leachate Collection and Recovery System Low Flow Pump Flow	IN-201	GPM	0-38	4-20mA	I:01/01	No. 1	
3	0	FT	CD	204	Landfill Leak Detection and Recovery System Pump Flow	IN-201	GPM	0-38	4-20mA	I:01/02	No. 1	
4	0	FT	CD	208	Landfill Secondary Leak Detection and Recovery System Pump Flow	IN-201	GPM	0-38	4-20mA	I:01/03	No. 1	
5	0	LT	CD	103	Landfill Leachate Collection and Recovery System Level	IN-201	Inches	0-12	4-20mA	I:01/04	No. 2	
6	0	LT	CD	104	Landfill Leak Detection and Recovery System Level	IN-201	Inches	0-12	4-20mA	I:01/05	No. 2	
7	0	LT	CD	108	Landfill Secondary Leak Detection and Recovery System Level	IN-201	Inches	0-12	4-20mA	I:01/06	No. 2	
8	0	TT	CD	1799	Landfill Crest Pad Building Temperature	IN-201	Celsius	-40 to 40	4-20mA	I:01/07	No. 3	
9	0				Blank Module							Blank in Address Slot 2
10	0	HS	CD	203-1	Landfill Leachate Collection and Recovery System High Flow Pump Auto Status	IN-201	Auto/Manual		24V dc	I:03/00	No. 4	
11	0	YL	CD	203-1	Landfill Leachate Collection and Recovery System High Flow Pump On Status	IN-201	On/Off		24V dc	I:03/01	No. 4	
12	0	HS	CD	203-2	Landfill Leachate Collection and Recovery System Low Flow Pump Auto Status	IN-201	Auto/Manual		24V dc	I:03/02	No. 4	
13	0	YL	CD	203-2	Landfill Leachate Collection and Recovery System Low Flow Pump On Status	IN-201	On/Off		24V dc	I:03/03	No. 4	
14	0	HS	CD	204	Landfill Leachate Collection and Recovery System Pump Auto Status	IN-201	Auto/Manual		24V dc	I:03/04	No. 4	
15	0	YL	CD	204	Landfill Leachate Collection and Recovery System Pump On Status	IN-201	On/Off		24V dc	I:03/05	No. 4	
16	0	HS	CD	208	Landfill Secondary Leachate Collection and Recovery System Pump Auto Status	IN-201	Auto/Manual		24V dc	I:03/06	No. 4	
17	0	YL	CD	208	Landfill Secondary Leachate Collection and Recovery System Pump On Status	IN-201	On/Off		24V dc	I:03/07	No. 4	
18	0	LSH	CD	105	Landfill Crest Pad Building Sump Level High	IN-201	High/Normal		24V dc	I:03/08	No. 4	
19	0	LSHH	CD	105	Landfill Crest Pad Building Sump Level High High	IN-201	High-High /Normal		24V dc	I:03/09	No. 4	High High Shuts Down Process Pumps
20	0	LSL	CD	105	Landfill Crest Pad Building Sump Level Low	IN-201	Low/Normal		24V dc	I:03/10	No. 4	
21	0	JSH	CD	1799	Landfill Crest Pad Building Power Status	IN-201	Normal/Fail		24V dc	I:03/11	No. 4	
22	0	NE	CD	1799	Landfill Crest Pad Building Smoke Alarm	IN-201	Normal/Fail		24V dc	I:03/12	No. 4	
23	0	ZS	CD	1799	Landfill Crest Pad Building Door Position Status	IN-201	Open/Close		24V dc	I:03/13	No. 4	
24	0	HS	CD	205	Landfill Crest Pad Building Sump Pump Auto Status	IN-201	Auto/Manual		24V dc	I:03/14	No. 4	
25	0	YL	CD	205	Landfill Crest Pad Building Sump Pump On Status	IN-201	On/Off		24V dc	I:03/15	No. 4	Wire in spare inputs
26	0				Blank Module							Blank in Address Slot 4
27	0	YS	CD	203-1	Landfill Leachate Collection and Recovery System High Flow Pump Start Command	IN-201	Start/Stop		24V dc	O:05/00	No. 4	
28	0	YS	CD	203-2	Landfill Leachate Collection and Recovery System Low Flow Pump Start Command	IN-201	Start/Stop		24V dc	O:05/01	No. 4	
29	0	YS	CD	204	Landfill Leak Detection and Recovery System Pump Start Command	IN-201	Start/Stop		24V dc	O:05/02	No. 4	
30	0	YS	CD	208	Landfill Secondary Leak Detection and Recovery System Pump Start Command	IN-201	Start/Stop		24V dc	O:05/03	No. 4	
31	0	YS	CD	1799	Landfill Crest Pad Building General Alarm	IN-201	Normal/Fail		24V dc	O:05/04	No. 5	
32	0				Spare Output	IN-201			24V dc	O:05/05	No. 4	Wire in spare outputs
33	0				Spare Output	IN-201			24V dc	O:05/06	No. 4	Wire in spare outputs
34	0				Spare Output	IN-201			24V dc	O:05/07	No. 4	Wire in spare outputs
35	0				Blank Module							Blank in Address Slot 6
36	0	FT	CD	207	Evaporation Pond Combined Sump Flow	IN-202	GPM	0-38	4-20mA	I:01/00	No. 1	
37	0	FT	CD	327	Evaporation Pond Truck Loading/Unloading Flow	IN-202	GPM	0-149	4-20mA	I:01/01	No. 1	
38	0	FT	CD	330	Evaporation Pond Wastewater from SSSTF Flow	IN-202	GPM	0-149	4-20mA	I:01/02	No. 1	
39	0	LT	CD	101	Evaporation West Pond Leak Detection and Recovery System Level	IN-202	Inches	0-12	4-20mA	I:01/03	No. 2	
40	0	LT	CD	102	Evaporation East Pond Leak Detection and Recovery System Level	IN-202	Inches	0-12	4-20mA	I:01/04	No. 2	
41	0	TT	CD	1798	Evaporation Pond(s) Crest Pad Building Temperature	IN-202	Celsius	-40 to 40	4-20mA	I:01/05	No. 3	
42	0	FT	CD	201	West Evaporation Pond Leak Detection Flow	IN-202	GPM	0-38	4-20mA	I:01/06	No. 1	
43	0	FT	CD	202	East Evaporation Pond Leak Detection Flow	IN-202	GPM	0-38	4-20mA	I:01/07	No. 1	

PLC Input and Output List												
Item	Rev	Tag 1 ISA	Tag2 Process	Tag3 Loop	Description	P&ID	Engineering Units	Range	Voltage/Current	Address	Typical Wiring Diagram	Notes
44	0	FT	CD	210	Raw Water Flow	IN-202	GPM	0-149	4-20mA	I:02/00	No. 1	
45	0	FT	CD	211	Evaporator Pad Truck Loading Flow Detection	IN-202	GPM	0-38	4-20mA	I:02/01	No. 1	
46	0				Spare Input	IN-202			4-20mA	I:02/02		Wire in spare inputs
47	0				Spare Input	IN-202			4-20mA	I:02/03		Wire in spare inputs
48	0				Spare Input	IN-202			4-20mA	I:02/04		Wire in spare inputs
49	0				Spare Input	IN-202			4-20mA	I:02/05		Wire in spare inputs
50	0				Spare Input	IN-202			4-20mA	I:02/06		Wire in spare inputs
51	0				Spare Input	IN-202			4-20mA	I:02/07		Wire in spare inputs
52	0	HS	CD	201	Evaporation Pond(s) Leak Detection and Recovery System Pump Auto Status	IN-202	Auto/Manual		24V dc	I:03/00	No. 4	
53	0	YL	CD	201	Evaporation Pond(s) Leak Detection and Recovery System Pump On Status	IN-202	On/Off		24V dc	I:03/01	No. 4	
54	0	HS	CD	207	Evaporation Pond(s) Combined Sump Pump Auto Status	IN-202	Auto/Manual		24V dc	I:03/02	No. 4	
55	0	YL	CD	207	Evaporation Pond(s) Combined Sump Pump On Status	IN-202	On/Off		24V dc	I:03/03	No. 4	
56	0	LSH	CD	106	Evaporation Pond(s) Crest Pad Building Sump Level High	IN-202	High/Normal		24V dc	I:03/04	No. 4	
57	0	LSHH	CD	106	Evaporation Pond(s) Crest Pad Building Sump Level High High	IN-202	High-High/Normal		24V dc	I:03/05	No. 4	High High Shuts Down Process Pumps
58	0	JSH	CD	1798	Evaporation Pond(s) Crest Pad Building Power Status	IN-202	Normal/Fail		24V dc	I:03/06	No. 4	
59	0	NE	CD	1798	Evaporation Pond(s) Crest Pad Building Smoke Detector	IN-202	Normal/Fail		24V dc	I:03/07	No. 4	
60	0	ZS	CD	1798	Evaporation Pond(s) Crest Pad Building Door Postion Status	IN-202	Open/Close		24V dc	I:03/08	No. 4	
61	0	LSH	CD	499	Landfill Leachate Transmission Line Leak Detection Switch	IN-202	High /Normal		24V dc	I:03/09	No. 4	
62	0	LSH	CD	107	Evaporation Pond(s) Combined Sump Level High	IN-202	High /Normal		24V dc	I:03/10	No. 4	
63	0	LSHH	CD	107	Evaporation Pond(s) Combined Sump Level High High	IN-202	High High /Normal		24V dc	I:03/11	No. 4	
64	0	LSL	CD	107-1	Evaporation Pond(s) Combined Sump Level Low	IN-202	Low/Normal		24V dc	I:03/12	No. 4	
65	0	HS	CD	201	Evaporation Pond(s) Leak Detection and Recovery System Pump Auto Status	IN-202	Auto/Manual		24V dc	I:03/13	No. 4	
66	0	YL	CD	201	Evaporation Pond(s) Leak Detection and Recovery System Pump On Status	IN-202	On/Off		24V dc	I:03/14	No. 4	
67	0	HS	CD	202	Evaporation Pond(s) Leak Detection and Recovery System Pump Auto Status	IN-202	Auto/Manual		24V dc	I:03/15	No. 4	
68	0	YL	CD	202	Evaporation Pond(s) Leak Detection and Recovery System Pump On Status	IN-202	On/Off		24V dc	I:04/00	No. 4	
69	0	LSH	CD	109	SSSTF Line Leak Detection Switch	IN-202	High /Normal		24V dc	I:04/01	No. 4	
70	0				Spare Input	IN-202			24V dc	I:04/02		Wire in spare inputs
71	0				Spare Input	IN-202			24V dc	I:04/03		Wire in spare inputs
72	0				Spare Input	IN-202			24V dc	I:04/04		Wire in spare inputs
73	0				Spare Input	IN-202			24V dc	I:04/05		Wire in spare inputs
74	0				Spare Input	IN-202			24V dc	I:04/06		Wire in spare inputs
75	0				Spare Input	IN-202			24V dc	I:04/07		Wire in spare inputs
76	0				Spare Input	IN-202			24V dc	I:04/08		Wire in spare inputs
77	0				Spare Input	IN-202			24V dc	I:04/09		Wire in spare inputs
78	0				Spare Input	IN-202			24V dc	I:04/10		Wire in spare inputs
79	0				Spare Input	IN-202			24V dc	I:04/11		Wire in spare inputs
80	0				Spare Input	IN-202			24V dc	I:04/12		Wire in spare inputs
81	0				Spare Input	IN-202			24V dc	I:04/13		Wire in spare inputs
82	0				Spare Input	IN-202			24V dc	I:04/14		Wire in spare inputs
83	0				Spare Input	IN-202			24V dc	I:04/15		Wire in spare inputs
84	0	YS	CD	201	Evaporation Pond(s) Leak Detection and Recovery System Pump Start Command	IN-202	Start/Stop		24V dc	O:05/00	No. 4	
85	0	YS	CD	207	Evaporation Pond(s) Combined Sump Pump Start Command	IN-202	Start/Stop		24V dc	O:05/01	No. 4	
86	0	YS	CD	1798	Evaporation Pond(s) Crest Pad Building General Alarm	IN-202	Normal/Fail		24V dc	O:05/02	No. 5	

PLC Input and Output List												
Item	Rev	Tag 1	Tag2	Tag3	Description	P&ID	Engineering	Range	Voltage/Current	Address	Typical Wiring	Notes
		ISA	Process	Loop			Units				Diagram	
87	0	YS	CD	202	Evaporation Pond(s) Leak Detection and Recovery System Pump Start Command	IN-202	Start/Stop		24V dc	O:05/03	No. 4	
88	0				Spare Output	IN-202			24V dc	O:05/04	No. 4	Wire in spare outputs
89	0				Spare Output	IN-202			24V dc	O:05/05	No. 4	Wire in spare outputs
90	0				Spare Output	IN-202			24V dc	O:05/06	No. 4	Wire in spare outputs
91	0				Spare Output	IN-202			24V dc	O:05/07	No. 4	Wire in spare outputs
92	0				Blank Module							Blank in Address Slot 6

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INSTRUMENT CALIBRATION SHEET

Rev.06.05.92

COMPONENT	MANUFACTURER	PROJECT
Code:	Name:	Number:
Name:	Model:	Name:
	Serial #:	

FUNCTIONS

	RANGE	VALUE	UNITS
Indicate? Y / N	Chart:		
Record? Y / N	Scale:		
Transmit/ Convert? Y / N	Input:		
	Output:		

COMPUTING FUNCTIONS? Y / N
Describe:

CONTROL? Y / N
Action? direct / reverse
Modes? P / I / D

SWITCH? Y / N
Unit Range:
Differential: fixed/adjustable
Reset? automatic / manual

ANALOG CALIBRATIONS

REQUIRED			AS CALIBRATED			
			Increasing Input		Decreasing Input	
Input	Indicated	Output	Indicated	Output	Indicated	Output
CONTROL MODE SETTINGS:			P:	I:	D:	

DISCRETE CALIBRATIONS

	REQUIRED		AS CALIBRATED		Note No.
Number	Trip Point	Reset Pt.	Trip Point	Reset Pt.	
	(note rising or falling)		(note rising or falling)		
1.					
2.					
3.					
4.					
5.					
6.					
7.					

#	NOTES:

Component Calibrated and Ready for Startup
By:
Date:
Tag No.:

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INSTRUMENT CALIBRATION SHEET

EXAMPLE - ANALYZER/TRANSMITTER

Rev.06.05.92

COMPONENT	MANUFACTURER	PROJECT
Code: *A7*	Name: *Leeds & Northrup*	Number: *WDC30715.B2*
Name: *pH Element & Analyzer/Transmitter*	Model: *12429-3-2-1-7*	Name: *UOSA AWT PHASE 3*
	Serial #: *11553322*	

FUNCTIONS

	RANGE	VALUE	UNITS	COMPUTING FUNCTIONS? N
Indicate? Y Record? N	Chart:			Describe:
	Scale:	*1-14*	*pH units*	
Transmit/ Convert? Y	Input:	*1-14*	*pH units*	
	Output:	*4-20*	*mA dc*	

CONTROL? N
Action? direct / reverse
Modes? P / I / D

SWITCH? N
Unit Range:
Differential: fixed/adjustable
Reset? automatic / manual

ANALOG CALIBRATIONS

REQUIRED			AS CALIBRATED			
Input	Indicated	Output	Increasing Input		Decreasing Input	
			Indicated	Output	Indicated	Output
1.0	*1.0*	*4.0*	*1.0*	*4.0*	*1.0*	*3.9*
2.3	*2.3*	*5.6*	*2.2*	*5.5*	*2.3*	*5.6*
7.5	*7.5*	*12.0*	*7.5*	*11.9*	*7.5*	*12.0*
12.7	*12.7*	*18.4*	*12.7*	*18.3*	*12.6*	*18.3*
14.0	*14.0*	*20.0*	*14.0*	*20.0*	*14.0*	*20.0*
CONTROL MODE SETTINGS:			P: *N.A.*	I:	D:	

DISCRETE CALIBRATIONS

REQUIRED			AS CALIBRATED		Note
Number	Trip Point (note rising or falling)	Reset Pt.	Trip Point (note rising or falling)	Reset Pt.	No
1.	*N.A.*		*N.A.*		
2.					*1.*
3.					
4.					
5.					
6.					
7.					

#	NOTES:
	1. Need to recheck low pH calibration solutions.

Component Calibrated and Ready for Startup

By: *J.D. Sewell*

Date: *Jun-6-92*

Tag No.: AIT-12-6[pH]

CH2M HILL **I&C VALVE ADJUSTMENT SHEET** Rev.06.05.92

PARTS	Project Name:	Project Number:
Body	Type:	Mfr:
	Size:	Model:
	Line Connection:	Serial #:
Operator	Type:	Mfr:
	Action:	Model:
	Travel:	Serial #:
Positioner	Input Signal:	Mfr:
	Action:	Model:
	Cam:	Serial #:
Pilot Solenoid	Action:	Mfr:
	Rating:	Model:
		Serial #:
I/P Converter	Input:	Mfr:
	Output:	Model:
	Action:	Serial #:
Position Switch	Settings:	Mfr:
	Contacts:	Model:
		Serial #:
Power Supply	Type:	Air Set Mfr:
	Potential:	Model:
		Serial #:

ADJUSTMENTS	Initial	Date	**VERIFICATION**	Initial	Date
Air Set			Valve Action		
Positioner			Installation		
Position Switches			Wire Connection		
I/P Converter			Tube Connection		
Actual Speed					

REMARKS:	**Valve Ready for Startup**
	By:
	Date:
	Tag No.:

CH2M HILL **I&C VALVE ADJUSTMENT SHEET** Rev.06.05.92

EXAMPLE

PARTS	Project Name: *SFO SEWPCP*	Project Number: *SFO10145.G2*
Body	Type: *Vee-Ball*	Mfr: *Fisher Controls*
	Size: *4-inch*	Model: *1049763-2*
	Line Connection: *159 # ANSI Flanges*	Serial #: *1003220*
Operator	Type: *Pneumatic Diaphragm*	Mfr: *Fisher Controls*
	Action: *Linear - Modulated*	Model: *4060D*
	Travel: *3-inch*	Serial #: *2007330*
Positioner	Input Signal: *3-15 psi*	Mfr: *Fisher Controls*
	Action: *Direct - air to open*	Model: *20472T*
	Cam: *Equal percentage*	Serial #: *102010*
Pilot Solenoid	Action:	Mfr:
	Rating: *None*	Model:
		Serial #:
I/P Converter	Input: *4-20 mA dc*	Mfr: *Taylor*
	Output: *3-15 psi*	Model: *10-T-576-3*
	Action: *Direct*	Serial #: *1057-330*
Position Switch	Settings: *Closed / Open 5 deg, rising*	Mfr: *National Switch*
	Contacts: *Close / Close*	Model: *1049-67-3*
		Serial #: *156 &157*
Power Supply	Type: *Pneumatic*	Air Set Mfr: *Air Products*
	Potential: *40 psi*	Model: *3210D*
		Serial #: *1107063*

ADJUSTMENTS	Initial	Date	**VERIFICATION**	Initial	Date
Air Set	*JDS*	*Jun-06-92*	Valve Action	*JDS*	*Jun-03-92*
Positioner	*JDS*	*Jun-06-92*	Installation	*JDS*	*Jun-03-92*
Position Switches	*JDS*	*Jun-06-92*	Wire Connection	*JDS*	*Jun-04-92*
I/P Converter	*JDS*	*Jun-07-92*	Tube Connection	*JDS*	*Jun-04-92*
Actual Speed	*JDS*	*Jun-07-92*			

REMARKS: *Valve was initially installed backwards.*	**Valve Ready for Startup**
Observed to be correctly installed May-25-92	By: *J.D. Sewell*
	Date: *Jun-07-92*
	Tag No.: *FCV-10-2-1*

CH2M HILL **PERFORMANCE ACCEPTANCE TEST SHEET** *Rev.06.05.92*

Project Name:	Project No.:

Demonstration Test(s): For each functional requirement of the loop:
(a) List and number the requirement. (b) Briefly describe the demonstration test.
(c) Cite the results that will verify the required performance. (d) Provide space for signoff.

Forms/Sheets Verified	By	Date
Loop Status Report		
Instrument Calibration Sheet		
I&C Valve Calibration Sheet		

Performance Acceptance Test	By	Date
Performed		
Witnessed		

Loop Accepted By Contractor
By:
Date:
Loop No.:

CH2M HILL **PERFORMANCE ACCEPTANCE TEST SHEET** *Rev.06.05.92*

EXAMPLE

Project Name: *SFO SEWPCP Plant Expansion*	Project No.: *SFO12345.C1*

Demonstration Test(s): For each functional requirement of the loop:
(a) List and number the requirement. (b) Briefly describe the demonstration test.
(c) Cite the results that will verify the required performance. (d) Provide space for signoff.

1. MEASURE EFFLUENT FLOW

1.a With no flow, water level over weir should be zero and

FIT indicator should read zero. Jun-20-92 BDG

2. FLOW INDICATION AND TRANSMISSION TO LP & CCS

With flow, water level and FIT indicator should be related by expression

*Q(MGD) = 429*H**(2/3) (H = height in inches of water over weir).*

Vary H and observe that following.

2.a Reading of FIT indicator. Jun-6-92 BDG

2.b Reading is transmitted to FI on LP-521-1. Jun-6-92 BDG

2.c Reading is transmitted and displayed to CCS. Jun-6-92 BDG

H(measured)	*0*	*5*	*10*	*15*
Q(computed)	*0*	*47.96*	*135.7*	*251.7*
Q(FIT indicator)	*0*	*48.1*	*137*	*253*
Q(LI on LP-521-1)	*0*	*48.2*	*138*	*254*
Q(display by CCS)	*0*	*48.1*	*136.2*	*252.4*

Forms/Sheets Verified	By	Date	**Loop Accepted By Contractor**
Loop Status Report	*J.D. Sewell*	*May-18-92*	By: *J.D. Smith*
Instrument Calibration Sheet	*J.D. Sewell*	*May-18-92*	Date: *Jun-6-92*
I&C Valve Calibration Sheet	*N.A.*		
Performance Acceptance Test	By	Date	
Performed	*J. Blow MPSDC Co.*	*Jun-6-92*	
Witnessed	*B.deGlanville*	*Jun-6-92*	Loop No.: *30-12*